5-2010

The Ability of the Coping Competence Questionnaire to Predict Resilience Against Learned Helplessness Among Undergraduate College Students: An Experimental Study

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THE ABILITY OF THE COPING COMPETENCE QUESTIONNAIRE TO PREDICT RESILIENCE AGAINST LEARNED HELPLESSNESS AMONG UNDERGRADUATE COLLEGE STUDENTS: AN EXPERIMENTAL STUDY

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

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2010

ABSTRACT

The Ability of the Coping Competence Questionnaire to Predict Resilience Against Learned Helplessness Among Undergraduate College Students:

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by

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Utah State University, 2010

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The Coping Competence Questionnaire (CCQ), based on the reformulated learned helplessness theory, was designed to assess a general stress resistance versus a propensity towards learned helplessness with a brief, 12-item self-report questionnaire. In this study the CCQ was administered to 247 undergraduate students, who were then paired, in groups of around 24 at a time, and then randomly assigned to either success or failure conditions on the computer game TetraVex. Mood was pretested using the Profile of Mood States (POMS) depression subscale; the experimental condition, success or failure at TetraVex was conducted; then outcome measures including 20 five-letter anagrams to test performance and a posttest of the POMS depression subscale testing mood were administered. The first n = 80 participants were administered the anagrams then POMS; then the next n = 167 participants completed the POMS then anagrams. Findings indicate helplessness was induced. A statistically significant main effect of group was found for

both performance and mood measures, suggesting those who were exposed to success on the TetraVex puzzles performed better on the anagrams and had lower levels of depressed mood than those who were exposed to failure. A statistically significant main effect of CCQ on mood, indicating high CCQ scores were correlated with better mood, was also found. Three-way interactions of CCQ, group, and the order in which the outcome measures were administered suggested that when performance was measured first, the CCQ moderated the relationship between performance outcomes and group in the predicted direction, but when mood was measured first no interaction between performance and group resulted. Additionally, when mood was measured first, the mood effects were greater; however, coping competence, as measured by the CCQ, was inadequate to immediately overcome the frustration induced in the treatment group by TetraVex failure.

(126 pages)

ACKNOWLEDGMENTS

Without the help of many individuals this project would not have been possible. There are five groups of people who have all been essential in the completion of this project: My professors who have guided me in the process, those who have helped me with computer needs, professors who have helped in recruitment and participants to do the study, undergraduate research assistants who have participated in the execution of the study, the Graduate Student Senate, and my family members. Additionally, this study was funded by a Graduate Student Senate Research and Projects Grant.

I owe a debt of gratitude to my professors. First, I would like to thank my major professor, Dr. Kerstin Schroder, who has worked with me for the last three years planning and refining the elements and methodology employed in this study. She has endured my many questions and invested many hours providing great guidance throughout the completion of this dissertation project. I would also like to thank Dr. David Stein who has been willing to have additional meetings with Dr. Schroder and me to provide his input regarding what to do when data collection did not go as we had hoped. I would also like to thank my other committee members, Marty Blair, Dave Bush, and Scott DeBerard, for their support and comments.

I also owe a huge amount of gratitude to those who have helped me with computer applications. First I would like to thank my friend, Sean Hawkins, for his many hours of labor provided for so very little compensation. He is an amazing computer programmer. The program he wrote worked better than I imagined anything ever could. He was also willing to stick with it by making small changes for me throughout the year

as the study demanded. Thank you, Sean. Second, I would like to thank Jairo Velasques in the YETC computer lab for all of his help in getting things set up and running in the computer lab. Finally, I would like to thank Nathan Smith and the other staff members at the YETC for allowing me to use the computer lab, and working with me to see that I had what I needed.

I greatly appreciate the help provided by professors who have aided in the recruitment of participants for this study. First I would like to thank Dr. Michael Ballam and Ms. Julie Wheeler who have been willing to allow me to recruit students from their Creative Arts classes every semester for the whole school year. They have allowed me to make numerous announcements, made numerous announcements on my behalf, or allowed their teaching assistants to make announcements regarding the study in class. Finally, they have also shown support by motivating their students to participate with extra credit, because they know that repeated failure and depression both tend to plague individuals in the creative arts fields. I would like to thank Jessica Gundy and Dr. Clint Field for offering their psychology students credit or extra credit for participating in my study. I would also like to thank the participants, because with no participants I would not have had a study.

This project would also not have been possible for me to complete in time if it weren't for the many hours of help donated by my undergraduate research assistants. I would like to thank Suzie Polakova and Malinda Reich for continuously providing reliable help across both semesters of data collection, even though they were not getting internship credit for one of the semesters. I would also like to thank Erika Schwaneveldt, Leilani Player, Scott Bingham, Valerie Wahlquist, Michelle Sorensen, Heidi Llewellyn,

Sam Flukey, Trent Guymon, Brice Colby, and Aaron Combs who donated internship hours working with me to get these data collected.

Finally, I am grateful for the love and support my family has given me. My parents, Larry and Sharon Robertson, have shown unrelenting support, checking up on my progress, offering their suggestions and ideas, and sending movies for my children to watch so they'll be occupied and allow me to work on my dissertation. My husband, Jeremy, and daughters, Rebekah, Elizabeth, Hannah, and Sarah, have endured many hours of my being on the phone or computer working on my dissertation, and a few weeks when I haven't had much time to cook or clean because I've been holding data collection sessions. Thank you.

Cindy Ollis

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PROBLEM STATEMENT

When people are faced with events that they perceive to be uncontrollable and negative, there is a tendency to develop symptoms of learned helplessness that can lead to depressive episodes. People perceive an event as uncontrollable when they are exposed to a situation in which they believe none of the actions available to them will lead to the desired outcome, such as repeated failure. From such a situation, people may learn that they are unable to control the outcome.

Symptoms of learned helplessness include deficits in motivation, cognition, and emotional coping. The motivational deficit is characterized by a reduction in initiation of voluntary actions to attempt to solve the problem. The cognitive deficit is characterized by a slowing in one's ability to learn. The emotional deficit is characterized by a depressed mood. When each of these deficits is present they can, depending upon their severity, generalizability, and duration, increase the likelihood of depression.

The severity of these deficits in people has been linked to four main cognitive dimensions, three of which are linked to the causal attribution of the negative event. First, whether the person believes the cause of the negative event will apply generally to many areas of life (global attribution) or only in a specific area (specific attribution) affects the generalization of the helplessness deficits. Second, whether the person believes the cause will be long-enduring (stable attribution) or short-lived (unstable attribution) affects the longevity of the deficits. Third, whether the person believes the outcome is uncontrollable to all relevant people (external attribution) or only to themselves (internal attribution) affects how strongly one's self-esteem will be affected.

Finally, the importance of the uncontrollable outcome affects the overall impact of all three deficits.

How a person ranks on these three attributional dimensions is known as their attributional style. To develop depressogenic symptoms from the learned helplessness deficits resulting from negative life events, a person must believe that the cause of the uncontrollable negative event will be widespread, long lasting, and primarily relevant to themselves. Some people are more inclined than others to attribute their negative outcomes or failures to causes that are global, stable, and internal, than others, making them more likely to develop generalized helplessness leading to severe and long-lasting periods of depression.

People who perceive that they are dealing with uncontrollable negative events may be faced with depressive episodes as a result of learned helplessness deficits. An understanding of a person's attributional style is useful in identifying who is more or less vulnerable to severe depressive episodes when exposed to uncontrollable negative events.

As a response to inadequacies found with existing instruments designed to measure a propensity toward learned helplessness, the Coping Competence Questionnaire (CCQ) was developed. The purpose of the CCQ is to assess a person's resilience to learned helplessness when confronted with repeated failure or negative events in life.

The CCQ has been found both valid and reliable in previous studies. Data from five correlational studies looking at convergent and divergent validity, Cronbach's alpha, and test retest reliabilty are promising. However, the CCQ had never been tested for predictive validity among people who will and will not develop learned helplessness deficits when faced with repeated failure in an experimental investigation.

The purpose of this study was to assess the effectiveness of the CCQ in discriminating between those who are more and less likely to develop learned helplessness deficits when faced with repeated failure. In this randomized controlled experiment, participants were randomly assigned to receive either a solvable or an unsolvable cognitive task. Subsequently, performance was tested using a solvable cognitive puzzle; in addition, a mood questionnaire was administered to see who showed signs of the emotional deficits associated with learned helplessness. The main effect of group was of interest in determining whether or not helplessness was successfully induced. The main effect of CCQ was of interest as a potential predictor performance and/or mood. In addition to testing main effects of the experimental condition and coping competence on performance and depression, particular emphasis was placed on the interaction between group and preexisting CCQ scores. Theoretically, participants' responses to repeated failure should be moderated by coping competence. People high in coping competence should show a greater resilience against learned helplessness than people low in coping competence.

REVIEW OF LITERATURE

The theory of learned helplessness is an older theory that has been shaped over time (McClure, 1985). It was first discovered in animal research then applied to humans where it has been refined (McClure, 1985; Overmier & Seligman 1967).

Discovery of Learned Helplessness in Dogs

The concept of learned helplessness was detected accidentally by Overmier and Seligman (1967). In the process of testing a hypothesis based on a Pavlovian theory of fear conditioning, they exposed dogs in a treatment group to inescapable shock while strapped into rubber hammocks, then 24 hours later put the dogs, one at a time, into a two-shuttle box where the dogs were shocked until jumping over a shoulder-high barrier. Contrary to the expectation that dogs pre-exposed to shock would learn to more rapidly escape they found that typically the dogs who had been preexposed to shock would quickly stop trying to escape the shock, and on the occasion that they did escape the shock, they did not learn from their experience as the dogs who were not preexposed did. Overmier and Seligman referred to this response as "learned helplessness." These same behaviors were reproduced multiple times (Overmier, 1968; Overmier & Seligman, 1967; Seligman & Maier, 1967; Seligman, Maier, & Geer, 1968).

Seligman later noted (1975) that the helpless dog behaves differently than the nonhelpless dog outside of a shuttle box too. Typically, when an experimenter goes to get a dog, the dog goes to the back corner of his cage and barks, behavior that is helpful in avoiding the researcher. Helpless dogs, however, were despondent and did not resist.

Learned Helplessness Applied to Humans

Hiroto (1974) was among the first to conduct a similar experiment with introductory psychology students. In place of the inescapable shock versus no inescapable shock that was used in the dog experiments to induce helplessness (Overmier, 1968; Overmier & Seligman, 1967; Seligman & Maier, 1967; Seligman et al., 1968), the students listened to a 3000hrz 110dbl prerecorded tone that was played through headphones (Hiroto, 1974). Thirty trials lasting 5 seconds each were played for two thirds of the students, while the remaining third received no pretreatment. The students who did receive the pretreatment also were given a button and told that there was something they could do to turn the tone off. In place of trials in the shuttle box, students were given 18 trials with a manipulandum to use in their attempts to stop the noise. The manipulandum consisted of a knob that could be slid in a wooden track and had three positions, left, middle, and right. If the students moved the manipulandum to one side for one trial then slid it to the other side for the next trial the tone would stop or be avoided.

Hiroto's (1974) results with a population of introductory psychology students were very similar to those received by Overmier, Seligman, and colleagues (Overmier, 1968; Overmier & Seligman, 1967; Seligman & Maier, 1967; Seligman et al., 1968). He found that the subjects exposed to the inescapable noise pretreatments did not escape from the noise during the test scenario with the manipulandum nearly as well as the students who had either not been exposed to the noise at all, or who were exposed to the escapable noise. Hiroto reports that less than half of the students exposed to the

inescapable noise in the pretreatment phase learned how to escape the noise during the test phase, whereas only about 13% of those who were not exposed to the inescapable noise failed to learn to escape the noise during the test trials. He also found that those students who believed that their success was controlled by someone else, such as the experimenter in this case, did more poorly at escaping the noise than those who believed they were in control of their own success.

Several other studies similar to Hiroto's (1974) have been conducted using aversive noise to induce helplessness and test for learned helplessness (Alloy, Peterson, Abramson, & Seligman,1984; Donovan & Leavitt, 1985; Hiroto & Seligman, 1975; Klein & Seligman, 1976). They all used recorded tones for both the induction and testing of helplessness deficits, except Donovan and Leavitt who used recorded baby cries to induce helplessness on mothers.

Seligman (1975) theorized that the responses that had been observed in most of the dogs and the humans exposed to the inescapable shock, and referred to as learned helplessness, were a direct result of the fact that the subjects perceived the undesired outcome as being uncontrollable. He described an event that is perceived to be uncontrollable as any circumstance in which all responses a person has within their repertoire, or their ability to produce, are insufficient to create the desired outcome. He went on to explain that when a person realizes that there is nothing that he or she can do that will lead to the desired outcome, the person begins to see responding as futile, and response initiations subsequently diminish.

Deficits

Three types of deficits were observed in both helpless dogs and humans (Alloy et al., 1984; Donovan & Leavitt, 1985; Hiroto 1974; Hiroto & Seligman, 1975; Klein & Seligman, 1976; Peterson & Seligman 1984; Seligman, 1975). The first was a cessation in attempts to escape the aversive stimulus (Seligman, 1975). The participants exposed to repeated failure on the first task failed to perform as well on the test task as the participants not previously exposed to failure (Alloy et al., 1984; Donovan & Leavitt, 1985; Hiroto & Seligman, 1975; Klein & Seligman, 1976). This deficit was referred to by Seligman as a motivational deficit. The second deficit experienced by the helpless was a failure to learn from the occasions in which they had successfully dealt with the aversive stimulus due to an inability to recognize that control was actually possible. This deficit was referred to as a cognitive deficit. The third deficit shown was an emotional deficit (Peterson & Seligman, 1984). The helpless dogs showed no overt emotionality, while the helpless humans took on a depressed mood affect (Peterson & Seligman, 1984; Seligman, 1975).

People with learned helplessness deficits, resulting from outcomes they have come to expect to be uncontrollable and negative, were likened by Seligman (1975) to people with the symptoms of clinical depression. He pointed out that all of the deficits seen in those with learned helplessness were also common symptoms of depression, and thus suggested that his concept of learned helplessness was a model for depression.

Learned Helplessness Extended Beyond Aversive Stimuli to Cognitive Challenges

Thus far all of the instances of learned helplessness discussed have been induced

and tested using aversive stimuli. Hiroto and Seligman (1975) extended the theory of learned helplessness one step further by using both aversive tones and a cognitive puzzle for both the treatment and the posttest (n = 96). There were three main groups (each n = 32). The treatment group received insolvable pretreatment tasks. Another group received solvable pretreatment tasks, and a third control group got to look at the tasks, but was not allowed to attempt to solve them. Next, they randomly divided each of these three groups into half, assigning one subgroup to receive uncontrollable noise, and the other subgroup to an unsolvable cognitive puzzle. Finally, each of the six experimental groups was further divided randomly to receive one of two different test tasks; learning to escape an aversive tone, or solving 20 anagrams. The authors found a strong effect of the experimental condition, indicating learned helplessness in only the group receiving an unsolvable pretest. Within this group, neither the type of unsolvable pretest (noise/cognitive task) nor the type of test task (noise vs. cognitive task) had an effect. All four subgroups exposed to uncontrollable failure in the pretest presented with the symptoms of learned helplessness, regardless of whether they received uncontrollable noise or unsolvable cognitive puzzles. These results suggest that learned helplessness can be induced by a wide variety of tasks involving uncontrollable sensory input or failure at cognitive tasks, and that helplessness can generalize to test tasks that are different from the tasks used to induce learned helplessness.

Inducing learned helplessness. Since the study by Hiroto and Seligman (1975), various cognitive tasks have been used to successfully induce learned helplessness in the laboratory. In most of these studies, a common technique was applied, involving a problem-solving task. Typically, participants were instructed to detect a specific pattern

or principle leading to the solution. For the treatment group, this task was commonly created to be unsolvable and combined with noncontingent intermittent feedback preventing the detection of a true pattern. The most common task, referred to as a Levine-type task, was a discrimination problem (Barber & Winefield, 1987; Diener & Dweck, 1978, 1980; Mikulincer & Nizan, 1988; Pasahow, 1980; Tennen & Eller, 1977). It involved cards, each of which had two pictures on it. Each picture displayed a combination of characteristics (most commonly four characteristics), one each of four binary dimensions, leading to a total of 16 different possible combinations. For example, Pasahow (1980) used as the four dimensions for his study: letter (either A or T), background (either shaded or unshaded), size (either large or small), and border shape (circle or square). Participants' task was to detect the particular pattern or dimension in a sequence of cards that would define the "solution." For those in the treatment group no dimension was selected as the right dimension, feedback was noncontingent, and all participants were told in the end that they failed to find the answer. Similarly, Douglas and Anisman (1975) used a task in which the participant was given three buttons and told to figure out how to turn off each of three different colored lights using the buttons, but for the treatment group there was no contingency between response and outcome. Cemalcilar, Canbeyli, and Sunar (2003) used unsolvable mazes to induce learned helplessness. Roth and Kubal (1975) used a card task in which participants were asked to identify which of the two bottom options correctly illustrates the principle governing a change from the top figure. They were on their own to discover what that principle was, but for those in the treatment group only noncontingent feedback was provided. All of these methods were successful at inducing helplessness.

One field study conducted by Faulkner (2001) did not use either a cognitive task or an inescapable aversive stimulus. He believed that disempowering care leads to a higher level of patient dependence because disempowering care teaches the patients that their circumstances are uncontrollable leading to patients who are unable to perform tasks on their own. Faulkner successfully induced helplessness by having people overassist patients in a long-term care facility with their meal-time event.

One study failed to produce learned helplessness deficits. Tennen, Drum, Gillen, and Stanton (1982) used aversive noise to induce helplessness and five-letter anagrams to test for learned helplessness. Both of these methods have been well tested. They, however, added one more step, a pretest with solvable six-letter anagrams, in an attempt to cancel out individual differences. It seems that by adding the pretest, the authors inadvertently prevented the development of learned helplessness. This was done through the process of immunization, or teaching the participants that they can solve a task before trying to cause them to believe that they cannot solve the task. Once people have learned they can do something, it is much more difficult to get them to believe that they have no control over subsequent outcomes.

Methods used to measure learned helplessness. Various cognitive tasks have also been used to successfully test for learned helplessness deficits in human subjects (Barber & Winefield, 1987; Cemalcilar et al., 2003; Diener & Dweck, 1978, 1980; Douglas & Anisman, 1975; McFarland & Ross, 1982; Mikulincer & Nizan, 1988; Miller & Seligman, 1975; Pasahow, 1980; Roth & Kubal, 1975; Tennen & Eller, 1977). The most commonly used cognitive task to test for helplessness was anagrams (Barber & Winefield, 1987; Cemalcilar et al., 2003; Hiroto & Seligman, 1975; Miller & Seligman,

1975; Pasahow, 1980; Tennen & Eller, 1977). The anagram task involved unscrambling letters (usually 5) to form a word. Each word was (usually) scrambled using the same out-of-order pattern, 3-4-2-5-1, so after a participant learned the pattern, the words could be unscrambled very quickly. The common outcome measures for this task included: the amount of time it took for the participant to discover the pattern (measured by successfully solving three consecutive anagrams in 15 seconds each), the number of failures to solve or number of successful solutions, and the mean response latency. Tennen et al. (1982) used noise as an aversive stimulus to induce helplessness, and an anagram task to test for helplessness deficits. They found that subjects who believed they had little or no control over the noise performed more poorly on the anagram task than did participants who believed they were able to control the noise.

The weighted standardized mean difference effects size (SMDES) from these 6 studies was calculated, using only the control groups that attempted to solve solvable tasks and treatment groups that attempted to solve unsolvable tasks and for whom attribution was not directly manipulated by telling them the tasks were easy or difficult. The SMDES of the mean latency was $d = .72$. The SMDES of the number of number of failures to solve/number of successful solutions was $d = .76$.

Several other test tasks were used in only one or two studies each to measure helplessness deficits. Although the tasks differed, the measures taken to asses helplessness deficits were quite similar, typically involving some measure of performance (such as the number of correctly solved tasks or the number of errors) and in some studies, a measure of processing speed. Diener and Dweck (1978, 1980) analyzed the strategies (or lack of strategy) used by the children to solve Levine discrimination

problems of the same type that were used to induce helplessness in the experimental manipulation phase of the study. They then categorized the strategies used by the students and compared the frequency of effective and ineffective strategies used for the students in both the treatment and the control groups. In a series of three studies, Douglas and Anisman (1975) used two different measures to asses learned helplessness. In one study, they counted the number of errors and assessed the time needed to complete a number of maze tasks. In the other two studies they used a solvable version of the task employed to induce helplessness, assessing the number of correct responses and the latencies for each response. Mikulincer and Nizan (1988) had participants visually search a matrix of letters to identify four target letters that they had to remember. They measured the total number of letters scanned in one minute, and the percentage of target letters that were identified.

Several other outcome measures have been employed that are not strictly cognitive tasks, but rather measures of behavior, emotion, self-esteem, self-evaluation, or attribution to help indicate learned helplessness deficits. For example, McFarland and Ross (1982) used a self-report measure of perceived success on a memory task. All five of these methods successfully show a reduction in performance among those exposed to repeated failure. Faulkner (2001) used a behavioral indicator by measuring the amount of time residents in a long term care facility spent engaged in instrumental activity related to feeding themselves after half of them had been overly assisted with the meal-time event. Other studies have included the administration of instruments or incidental questions to measure: emotional well-being, such as the Beck Depression Inventory (BDI); self-esteem, such as the Coopersmith self-esteem scale; or attribution, such as the

Attributional Style Questionnaire (ASQ) and the Intellectual Achievement Responsibility (IAR; Alloy et al., 1984; Barber & Winefield, 1987; Diener & Dweck, 1978, 1980; Klein & Seligman, 1976; McFarland & Ross, 1982; Mikulincer & Nizan, 1988; Miller & Seligman, 1975; Pasahow, 1980; Roth & Kubal, 1975; Tennen & Eller, 1977) and other incidental questions asking the participants to rate aspects of their performance, mood, and other possible causes for their failure/success.

However, several studies appeared to be unsuccessful in creating a test task suitable to assess learned helplessness deficits (Roth & Bootzin, 1974; Tennen et al., 1982). Following the experimental manipulation pattern of exposing the experimental group to uncontrollable tasks and the control group to controllable tasks, Roth and Bootzin (1974) asked college students to solve problems requiring the use of a TV screen until a specified number of correct responses were produced. The researchers then caused the screen to blur on every tenth item preventing the participants from solving every tenth item. The expected response was for nonhelpless students to fetch the researcher to come and fix the screen. What they found however was that the students who had been exposed to an uncontrollable task, and therefore should have been rendered helpless, went and got the researcher 100% of the time to come fix the TV, while those students who had been exposed to a controllable task along with those students who had not been exposed to any previous task went to get the researcher only 14% of the time. The authors suggested that perhaps they had not successfully induced helplessness, however, due to the fact that the same task was successfully used in a later study conducted by Roth and Kubal (1975) to induce helplessness, this is unlikely to be the case. This author believes that it was their test task that was ineffective. Getting up to go

get someone to fix a problem rather than trying to deal with it themselves or function around the difficulty is likely a sign that the person has actually given up on some element of the task itself. This likely sign that someone has given up on at least some portion of the task is itself a sign of learned helplessness. Another possibility is that the fuzzy screen may have changed their attribution from internal to external, leading them to believe that they were not responsible for their failures, and wanting to make sure the researchers knew it was not their fault they were having trouble. Either of these theories would explain the unexpected outcome they got and suggest that the problem in finding learned helplessness deficits was due to an inefficient test task rather than a result of an unsuccessful experimental manipulation.

Reformulation of Learned Helplessness Theory

In 1978, Abramson, Seligman, and Teasdale expanded the learned helplessness theory in an attempt to account for findings that the original theory could not explain. They proposed, for a variety of reasons, that just the expectation of uncontrollability is not sufficient to induce a depressed affect. First, the uncontrollable event must lead to an undesirable outcome. For example, someone would not likely be depressed just because they won the lottery, but they could be depressed if their mom got struck by lightning and died. In addition, the new theory explained the occurrence, severity, and longevity of helplessness deficits as a result of a person's attributional pattern. The new model proposed that helplessness deficits are affected by at least three dimensions of causal attributions for failure or negative life events: (a) internal versus external attribution, (b) reference to a global versus specific cause, and (c) reference to a stable versus unstable

cause. The authors suggested that people who believe that failure is a result of personal shortcomings (i.e., who attribute failure internally) are more likely to display a lowered self-esteem and depression than people who believe that the lack of success is due to external factors that would affect the performance of other relevant people to the same degree, a concept not addressed by the old theory. Further, the new theory suggested that the generalization of helplessness deficits depends upon the globality of the perceived cause, and that the chronicity or longevity of the deficits was dependent upon the stability of the perceived cause of failure. Finally, the new model suggested that the severity of the depressive affect depended upon the importance of the uncontrollable outcome.

Data resulting from correlations between the attributional dimensions specified in the reformulated learned helplessness theory and depression or task performance have been controversial, but overall supportive of the reformulated learned helplessness theory, with small to moderate effect sizes (Coyne & Gotlib, 1983; Sweeney, Anderson, & Bailey, 1986). When directly manipulated, these new concepts specified in the reformulated theory by Abramson and colleagues (1978) found support in the literature. Cognitive perceptions directly manipulated in these studies included task importance, internal versus external causality of failure, and the presumed global or specific effects on the outcomes (Barber & Winefield, 1987; McFarland & Ross, 1982; Milkulincer & Nizan, 1988; Pasahow, 1980; Tennen & Eller, 1977). Tennen and Eller, and McFarland and Ross, modified the experimental manipulation used to induce learned helplessness by varying information about task difficulty, informing on group of participants that the task was easy and another group that the task was difficult. The idea was that those who were told the task was difficult would not be as affected by failure because they would assume

that most people failed, and therefore their failure would be attributed to the difficulty of the task (an external factor) rather than something that pertained only to them (an internal factor). In both of these studies helplessness was induced among the participants who were informed that the task was easy.

The distinction between task importance and globality versus specificity does not seem to be as clear. Three studies were conducted in which one group of participants who were caused to fail were led to believe that performance on the task they failed was an important predictor of a highly general ability, such as intelligence or academic performance, which is relevant in a wide variety of applications in life, while another group of participants was told that the task was highly specific and did not apply to anything else (Barber & Winefield, 1999; Mikulincer & Nizan, 1988; Pasahow, 1980). In all three of these studies, it was found that after failure on one task, performance on a subsequent test task was better among the participants who were told that performance on the task was not related to anything else that was of importance. Two of these studies reported this as a finding on globality, while the third study reported it as a finding on importance placed by the participant on the outcome of the task.

Individual Differences in Propensity Toward Learned Helplessness

Because everyone is different people do not all respond in the same way to stressful situations such as uncontrollable negative events or repeated failure. As Seligman (1975) pointed out after working with the dogs, only about two thirds of the animals exposed to the uncontrollable shock developed the learned helplessness deficits.

Also Hiroto (1974) pointed out that just over half of the students exposed to the uncontrollable noise developed learned helplessness deficits.

One moderator in people's responses to stressful or bad events is rooted in personality theory, and refers to the question of how people tend to attribute the cause(s) of their failures or stressful events. In the absence of a very clear cause, people will tend to develop a general style of attribution for their failures (Peterson et al., 1982). Those who believe that the uncontrollable outcome is very important and tend to attribute the causes of failure to internal, stable, and global factors are said to have a depressive attributional style (Seligman, Abramson, Semmel, & von Baeyer, 1979). An understanding of attributional style is useful in explaining why not all students exposed to the uncontrollable aversive stimuli develop learned helplessness deficits.

In response to this need to understand and measure attributional style, Peterson and colleagues (1982) developed The ASQ, which was later revised in the Expanded ASQ (EASQ; Peterson & Villanova, 1988). These questionnaires measure the three dimensions of the reformulated helplessness theory in three separate subscales. However, extensive research with these questionnaires revealed that they correlate poorly with general measures of depression (DeVellis & Blalock, 1992; Peterson & Villanova, 1988; Schroder & Ollis, 2010). These questionnaires may be less predictive than they should be because they only measure each of the three dimensions of the depressogenic attributional style in isolation (Schroder & Ollis, 2010). In contrast, the theory claims that all three dimensions, internal, stable, and global attribution must be combined in the person's explanatory style to indicate a tendency toward learned helplessness depression.

Additionally, a satisfactory way to combine the subscales of the ASQ does not appear to exist (Abramson, Dykman, & Needles, 1991; Peterson, 1991; Schroder & Ollis, 2010).

This leaves a need for some type of instrument that could measure a general predisposition toward learned helplessness without isolating the dimensions of the attributional style. It was intended to provide an overall picture of a person's propensity toward depressive episodes as a result of learned helplessness. In light of this need, the Coping Competence Questionnaire (CCQ) was developed (Schroder, 2004).

Coping Competence Questionnaire

The CCQ is a fairly new instrument for gauging a person's resilience to learned helplessness by assessing the depressogenic attributional style and related helplessness deficits in combination (Schroder, 2004; Schroder & Ollis, 2010). Data indicate that the CCQ is highly reliable, with a Cronbach's alpha greater than .90, and test retest reliabilities ranging from .70 to .84 over a 3-month time period, and .61 after 6 months (Ollis, Davies, & Schroder, 2008). Tests of convergent and divergent validity have also been conducted, and produced encouraging results. In comparison to the ASQ, data indicate a much stronger correlation with depression ranging from .53 to .57 (Ollis et al., 2008; Schroder & Ollis 2010). The CCQ, however, has never been tested to see if it is a moderator of stressful events and learned helplessness deficits in an experimental study. This study will assess the effectiveness of the CCQ in predicting those who are more and less likely to develop learned helplessness deficits when faced with repeated failure.

Hypotheses

1. Relative to a control group receiving solvable tasks, an experimental manipulation inducing repeated failure on a cognitive task will lead to learned helplessness deficits as evidenced by depressed mood and performance deficits on a subsequent test task.

2. Scores on the CCQ predict learned helplessness deficits beyond the effects of the experimental helplessness manipulation as manifested by depressed mood and performance on the test task.

3. Coping competence as assessed with the CCQ will moderate the impact of repeated failure on depressed mood and performance deficits. Specifically, high scores on the CCQ are expected to buffer (reduce) the impact of repeated failure on learned helplessness. Thus repeated failure is supposed to induce learned helplessness primarily among people with low scores on the CCQ but show little effect on depression and task performance among people with high CCQ scores.

METHODS

Design Overview

This study featured a randomized controlled experiment with two groups (failure induction vs. control group). The two independent variables were experimental group and coping competence as assessed with the CCQ. There were two predictors, group and CCQ scores, two main outcome measures, performance and mood, and a third outcome measure used for monitoring purposes to ensure experimental fidelity.

Sample

Participants were recruited through undergraduate classes, primarily Creative Arts, and some psychology classes, which offered course credit or extra credit for participation in this study. Based on findings in the literature, it was predicted that about 135 volunteers would be needed to effectively identify learned helplessness deficits (Peterson, Villanova, & Raps, 1985). Additionally, an a priori power analysis performed with PASS (a statistical power analysis program), featuring a multiple regression analysis with two covariates (group and CCQ) presumed to account for 20% of the total variance, and the interaction term accounting for an additional 4% of the variance suggested that a sample size of 152 participants would be needed to achieve a power of 80% at alpha .05. For a moderate-sized interaction accounting for 5% of the variance, a sample size of 120 would be needed. When a pretest for mood was included as an additional covariate in the first step, the power was increased. Based on this, it was predicted that a sample size of

about 150 would be adequate to test both main effects and the interaction between experimental group and CCQ scores on the outcomes.

The final sample size was substantially larger than projected. The reason for the increase in sample size was based on an observation with the initial 80 participants recruited in the fall semester of 2009 indicating that the sequence in which the dependent measures were taken may not be conducive to testing treatment effects on depression. More specifically, initially, participants were presented with the performance task before mood was assessed, however, because all participants experienced success to some degree in the test task prior to completing the mood scales, helplessness deficits on mood were likely to diminish.

Therefore, when data collection was continued in the spring of 2010, the sequence of the two dependent measures was reversed, with mood assessed first, prior to presenting the test tasks used to assess performance. The order in which the measures were taken was later entered as a covariate in the analyses. Thus, the total sample, $n = 247$, was composed of two participant groups distinguished by the order in which the participants completed the outcome measures; performance first, then mood ($n = 80$) or mood first, then performance ($n = 167$). The sample was composed of undergraduate students attending either a creative arts class or a psychology class at Utah State University (USU). Participants were excluded if they did not attend a computer lab session or if they did not have a student identification (ID) number at USU. The participants were primarily white, single, and Latter-day Saints, with an average age of nearly 21 years, $M = 20.97$, $SD = 4.53$ (see Table 1). The average number of hours worked per week was about ten and a half, $M = 10.44$, $SD = 12.55$. Most of the

Table 1

Descriptive Statistics of Continuous Demographic Variables

Demographic variable	*N*	Minimum	Maximum	Mean	*SD*
Age	247	17	47	20.77	4.526
Hours worked per week	246	0	70	10.44	12.547
Number of Children	247	0	8	.20	.900

participants did not have children, $M = 0.20$, $SD = 0.90$. There were 121 males and 126 females (see Table 2). Of the 247 participants 211were single, 33 were married, and 3 were divorced. There were 197 Latter-day Saint (LDS) students, 28 nonreligious students, 6 Catholics, 1 Methodist, 3 Protestants, 2 Muslim, and 10 students with other religions. White non-Hispanic was listed as the first race or ethnicity for 230 of the participants. There were 11 Hispanics, 3 Asians, 1 Pacific Islander, and 2 from other ethnic groups. Additionally, there were 8 students who listed a second race or ethnicity: 3 Hispanics, 3 Asians, 1 African American, and 1 other. Most of the students had high grade point averages (GPAs). There were 167 participants with GPAs between 3.51 and 4.00, inclusive. There were 45 participants with GPAs between 3.01 and 3.50, inclusive. There were 25 participants with GPAs between 2.51 and 3.00, inclusive. Only 8 participants had GPAs that were 2.50 or lower. Living arrangements were as follows: 148 lived with roommates, 41 lived with their parents, 20 lived with a spouse, 16 lived alone, 13 lived with a spouse and children, 7 lived with other family members, and 1 had other arrangements.

Table 2

Frequency Table of Categorical Demographic Variables

Demographic variable	Categories	Frequency	Percent
Gender	Male	121	49.0
	Female	126	51.0
	Total	247	100.0
Marital status	Single	211	85.4
	Married	33	13.4
	Divorced	3	1.2
	Total	247	100.0
Religion	Catholic	6	2.4
	LDS	197	79.8
	Methodist	1	0.4
	Muslim	2	0.8
	Protestant	3	1.2
	Other	10	4.0
	Not religious	28	11.3
	Total	247	100.0
Race/ethnicity 1st	White (non-Hispanic)	230	93.1
	Hispanic	11	4.5
	Asian	3	1.2
	Pacific Islander/Hawaiian	1	.4
	Other	2	0.8
	Total	247	100.0
Race/ethnicity 2nd	Hispanic	3	1.2
	Asian	3	1.2
	African American	1	.4
	Other	1	.4
	Total	8	3.2
High school GPA	0.00-2.00	2	0.8
	2.01-2.50	6	2.4
	2.51-3.00	25	10.1
	3.01-3.50	45	18.2
	3.51-4.00	167	67.6
	Total	245	99.2
Living arrangement	Alone	16	6.5
	With Parents	41	16.6
	With Room Mate(s)	148	59.9
	With Spouse	20	8.1
	With Spouse and Children	13	5.3
	With Other Family member(s)	7	2.8
	Other	2	.8
	Total	247	100.0

Procedures

In this section, the final study procedures are described, after necessary adjustments suggested by pilot investigations were implemented. The pilot work and the modifications prompted by this work are described following the methods section and prior to a reporting of the final results. In the final study, the procedures were as follows.

The study involved two separate parts. First, an online survey was to be completed by study participants, assessing demographic information, a priori depression, and coping competence. Second, participants were invited to the experimental part of the study, which took place in a computer lab. In order to prevent participants from guessing study hypotheses, they were led to believe that the two parts, the online survey and the computer lab session, were two separate unconnected studies.

The experimental study involved paired random assignment to either treatment or control group based on CCQ scores, depression scores, gender, and the time of completion of computer lab session. Participants who completed the mood outcome measure before the performance outcome measures were also matched on whether or not English was their primary language.

Recruitment

Students were recruited from undergraduate USU classes. A majority of the students were recruited from creative arts general education courses, with the remainder of the sample being recruited from psychology classes. All of these classes either required students to participate in a study conducted by the psychology department, or

offered extra credit for participation in the study. The researcher contacted the instructor of these classes, and either provided information for the instructor to share with the class, or visited the class and introduced the study to the students. The two-part study was introduced as two separate, apparently unrelated studies, one involving an online survey, and the second study involving completing tasks in a computer lab. Enrollment in the study required provision of the student ID number, which was entered into the online survey hosted on Blackboard, to provide access to the survey. Students were informed that a consent form for the survey part would be posted on Blackboard, and that participation required reading and signing on Blackboard their agreement to participate.

Further, students were informed that in the final portion of the online survey, they would be asked to provide contact information to schedule a time for the computer lab study. This study was introduced as a separate study conducted by people in Dr. Schroder's research group with interests in problem solving. It was also explained that this "second study" would be completed on the computer, and would be comprised of a computer game and a set of cognitive problems to solve. Some instructors required that their students participate in "both studies" in order to receive the extra credit. In these classes, no separate recruitment for the experimental part of the study was required. For students in classes receiving credit separately for the first and second phases of the study, interest in the lab study was assessed at the end of the online survey, and if interest was indicated, contact information was requested.

Stage 1: Online Study

Informed consent. The informed consent form for the online stage of the study was posted on Blackboard. Before students were given access to the survey, they had to read the consent form and click on the "I agree" button. It was explained that this study was on the psychosocial stress and wellbeing of undergraduate college students. It informed them that they would be asked to complete several questionnaires on Blackboard, and that no known negative effects were anticipated. They were told that they were free to quit anytime they wished. They were also told that their instructor would be informed of their participation so that course or lab credit could be awarded.

Elements included in the survey. Four surveys/questionnaires critical to this study were included in the survey part of the study:

1. Basic demographic information, 17 items;
2. CCQ, 12 items;
3. Center for Epidemiological Studies Depression scale (CES-D; Radloff, 1977). 20 items; and
4. Contact information needed to schedule the second experimental part of the study. Further, several questionnaires irrelevant to this study were included to distract the participants from the purposes of this study. These surveys included a hassles scale, a life events scale, some questions on their sources of help and inspiration, some health related questions, a survey on habitual self-control, and some questions about projected grade satisfaction and coping style. In total, the survey part took about 45 minutes to complete.

Stage 2: Experimental Part

Interested students were contacted by email and/or phone using the contact information they provided in the online survey. They were informed that this study would take about 75 to 90 minutes to complete. Once participants were recruited and scheduled for an experimental computer lab session, randomization was performed.

Matching. In order to ensure even distribution of crucial background variables between the two experimental groups, participants were grouped into matched pairs on several key variables prior to random assignment to a condition. These key variables included gender, CCQ scores, depression levels as assessed by the CES-D scale, and primary language (English or another language).

Matching on the CES-D involved categorization into three groups, indicating no depression (scores 1-15), mild depression (16-26), and moderate to severe depression (27 and above; Ensel, 1986; Zich, Attkisson, & Greenfield, 1990). A match across a CES-D group could be made if the two participants to be matched were within 5points of one another on their CES-D scores. The CES-D and CCQ scores of paired students were typically not identical but were as close together as possible given the students available for random assignment to groups at the time.

Matched randomization was performed separately for each of the experimental sessions, which were conducted in groups of approximately 24 students. Once the students were paired, a coin was tossed for the student with the higher CCQ score in the pair (if their CCQ scores were the same, then the coin was tossed for the student with the lowest CES-D score). If the coin landed with heads facing up, then the student was assigned to the treatment group and the other student in the pair was assigned to the

control group. If the coin landed with the tails side up, then the student was assigned to the control group, and the other student in the pair was assigned to the treatment group. In the few cases when students could not be paired within a session they were randomly assigned to an experimental group by tossing a coin. The unmatched participant was moved forward to the next session for randomization purposes, where a matching participant was identified and then assigned to the other group. Additionally, if someone did not attend their assigned session, then the participant with whom they were paired was moved forward to the next session and treated the same as a participant who was not matched initially due to lack of a suitable match within their session. For the final session, any students who could not be matched were randomly assigned to a group, and retained in the sample.

Informed consent. Upon arrival, the participants were presented with a hard copy of the informed consent form, which they were asked to read, sign and return to the research team. They were then offered a second copy for their records. This informed consent form explained that the study was being conducted "to critically evaluate the utility of some problem-solving tasks that are supposed to predict academic success in college and are currently being considered for inclusion in future versions of the SAT or the ACT." This was done to increase the perceived importance of good performance on the computer tasks, which is, according to the reformulated helplessness theory, an important requirement to be met for the development of learned helplessness following repeated failure.

Experimental manipulation. Once informed consent was provided, participants were reminded of a password they had created during the online survey and directed to

the computer that was preconfigured to respond to the respective participant's password only. Dependent on the experimental condition to which the participant was randomized, the program executed the "failure" or "success" condition of the treatment task. Prior to the experimental manipulation, participants listened to a prerecorded introduction (see Appendix A for Introduction Slide) and completed the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 2003), a survey assessing various mood states, including current depression.

Controllability of success or failure at a cognitive task was the focus of the experimental manipulation in this study. The task was to solve (or attempt to solve) TetraVex puzzles on the computer. The students were told that findings suggest that students who do well on this TetraVex task also tend to do well in other math and statistics courses.

TetraVex is a cognitive puzzle computer game that consists of a squared number of tiles, such as 9, 16, or 25 and so on (see Appendix A for a picture of the TetraVex demonstration slide). Each tile is square in shape, with an "X" drawn on it stretching from the top corners to the bottom corners. Each tile also has four numbers ranging from 0 – 9, one number on each side of the "X" (left, right, top, and bottom). The object of the game is to arrange the tiles into a larger square matrix, either 3 X 3, 4 X 4, or 5 X 5, and so on, so that each number on a tile touches either an identical number on an adjacent tile or is on the edge of the larger square matrix.

Each student in both the treatment and the control groups received the opportunity to watch a prerecorded demonstration of the experimenter solving a TetraVex puzzle that had a real solution (see Appendix A for transcript of the demonstration). While solving

the puzzle, the experimenter also explained the goal, demonstrated how the rules work and how to move the tiles, and provided some very basic strategy ideas. This provided an opportunity for the students to become familiar with the game. Following the demonstration puzzle, each student received 19 puzzles that were solvable for those in the control group, or that had no possible solution for those in the treatment group. At the end of each trial the student received feedback in terms of "congratulations" or "sorry time is up," and was informed that the next trial would begin in 3 seconds. Each trial could last a maximum of 90 seconds. For the control group it was projected that they would be able to solve the majority of the puzzles in 90 seconds or less. Because there were no solutions to the puzzles presented to the treatment group, the puzzles lasted the entire 90 seconds.

Posttest instruments and tasks. Two posttest instruments were administered: One to measure mood states and one to measure performance. Participants were asked to solve 20 anagrams as a measure of performance, and the POMS was used to reassess mood states. To assess whether the order of presentation of the outcome measures effects the outcomes, the first 80 participants received the performance measure first then the POMS was readministered, while for the next 167 participants the POMS was readministered and then the anagrams were presented. Finally, the students were asked to complete a short questionnaire regarding their experiences participating in the study.

The anagram task used in this study was similar to the anagram tasks discussed in the literature review portion of this paper. Twenty 5-letter words were selected from a list of 5-letter words that when reordered could not form any other English words (with the possible exception of proper nouns that would not be found in a dictionary; see

Appendix A for a list of the words). The words were then scrambled so that the pattern to unscramble the words was 3-4-2-5-1. For example the letters "utcea" can be reordered to form the word "acute". Participants first watched a prerecorded demonstration on how to solve anagrams (see Appendix A for demonstration slide and script), and then were given 90 seconds on the computer to unscramble each word. This process was repeated 20 times. The computer kept track of accuracy and latency.

Debriefing. At the end of the study, participants were debriefed (see Appendix A for debriefing scripts). Debriefing involved disclosure of the experimental manipulation; giving specific emphasis to the fact that the TetraVex tasks provided to those in the treatment condition were unsolvable. Further, it was explained that neither the TetraVex puzzles nor the anagrams are known to be predictive of academic success.

Measures

The measures used in this study are summarized in Table 3. The demographic questions included age, gender, year in college, average number of hours per week worked, major, marital status, living arrangement [alone, with parents, with roommate(s), with spouse, with spouse and children, with children, with other family member(s)], number of children, religion, high school GPA, ethnic background, and some questions about grade satisfaction. The CES-D is a 20 item scale with established reliability and validity as a measure of depression (see Conerly, Baker, Dye, Douglas, & Zabora, 2002; Devins, Orme, Costello, & Binik, 1988; Hann, Winter, & Jacobsen, 1999; Schroder & Ollis, 2010).

Table 3

Overview of the Measures and Their Purposes

Measures	Matching variable	Randomization check	Hypothesis 1	Hypothesis 2	Hypothesis 3	Hypothesis 4	Validity check
Pretests							
Demographics	X	X	---	---	---	---	---
CES-D	X	---	---	---	---	---	---
CCQ	X	---	X	X	X	X	---
POMS	---	---	X	X	X	X	---
Outcome variables							
Anagrams							
1. Number correct	---	---	X	X	X	X	---
2. Mean response latency	---	---	X	X	X	X	---
3. Elapse time to learn pattern	---	---	X	X	X	X	---
POMS	---	---	X	X	X	X	---
Questionnaire about participation in study	---	---	---	---	---	---	X

Coping Competence

Coping competence was assessed with the CCQ, a 12-item instrument used to assess resilience to learned helplessness (Ollis et al., 2008; Schroder, 2004; Schroder & Ollis, 2010). High scores indicate resilience to learned helplessness, while low scores indicate a propensity toward learned helplessness. Reponses were provided on a 6-point Likert scale ranging from 1 = *Very Uncharacteristic of me* to 6 = *Very characteristic of me*. Previous studies indicate that the CCQ is highly reliable with internal consistencies (Cronbach's alpha) ranging from .92 to .93. In the present study, Cronbach's alpha was .90.

Depressed Mood

Mood states were assessed with the POMS, a 65-item instrument frequently used in studies on emotional distress. Items are presented with five-point Likert response scales ranging from 0 = *Not at all* to 4 = *Extremely*. The POMS features six subscales assessing depressed mood, anger, tension, confusion, fatigue, and vigor. The reliability and validity of the POMS has been established in many studies. The Cronbach's alpha for the entire scale was at least .90 (McNair, Heuchert & Shilony, 2003; McNair, Lorr, & Droppleman, 1992; Nyenhuis & Yamamoto, 1999). The Cronbach's alpha of just the depression subscale was .95 (McNair el al., 1992). Cronbach's alpha in this study for the depression subscale was .92 for pretest and .92 for the posttest also. The test re-test of the depression subscale was $r = .74$ with the two tests ranging from 3-110 days apart, averaging 20 days apart.

Performance on the Test Task

Three indicators of test performance were derived from the anagram tasks: (a) the number of anagrams solved, with a possible range of 0 to 20; (b) the amount of time required to solved the anagrams; and (c) whether or not a participant detected the pattern underlying the scrambling of then anagrams. The 5-letter anagrams were all scrambled in the same order. That is, by detecting the sequence in which the letters were scrambled, a participant could solve all subsequent anagrams in a very small amount of time. Whether or not the pattern was detected was assessed by determining whether or not the last three anagrams were solved within 15 seconds each.

Participants' Experience

The participants were asked to respond to several questions regarding their experiences while participating in the study. The questions included (a) have they played TetraVex before; (b) how well they believed they performed on the TetraVex task; (c) why they believe they performed the way they did on the TetraVex task; (d) have they done anagrams before; (e) how well they believe they did on the anagram task; (f) why they believe they performed the way they did on the anagram task; (g & h) whether they enjoyed the TetraVex task, and the anagram task; and finally, (i) they were asked whether they are worried now about their future academic performance. These questions were employed to allow for potential qualitative analyses that could help explain the results. They were also used to gauge whether any participant in the treatment group detected that the puzzles were not solvable.

Analyses

Preliminary Analyses

Preliminary analyses involved randomization checks and manipulation checks. First, prior to any hypothesis testing, a randomization check was executed. The experimental groups were compared on demographic variables and pretest scores via ANOVAs and chi-square analyses to rule out any preexisting differences that could provide an alternative explanation for any significant group difference in the dependent variables. In addition, a manipulation check was performed to rule out the possibility that participants in the treatment group uncovered that the puzzles were not solvable. Further, it was checked whether participants claiming the puzzles were unsolvable were in the treatment or the control group. If this realization appeared to be rampant, the data from that session and any sessions to take place at a later date drawing participants from the same class had to be thrown out because it was no longer valid. Isolated cases were ignored.

Primary Analyses

The three hypotheses of the study were tested in a series of multiple regressions. In order to determine effects of the experimental condition (group) the order in which the outcomes were presented (order), CCQ scores, and their two-way and three-way interactions, on performance, as measured by the number of anagrams solved and latency, two hierarchical linear regressions were performed. GPA, group, and order were entered as predictors in the first step; CCQ was entered as a predictor in the second step; the two-way interactions were entered in the third step; and the three-way

interaction was entered in the fourth step. Based on the theory of learned helplessness, and if the CCQ can be regarded as a valid measure of resilience to learned helplessness, we would expect that control group members and participants with high CCQ scores would perform better on the anagrams. Further, and most importantly, given the claim that the CCQ assesses resilience against learned helplessness deficits, we would expect to see an interaction between experimental condition and CCQ scores, with participants characterized by high CCQ scores being less affected by the experimental manipulation relative to participants with low CCQ scores. If the order of the outcome measures had an effect, we would expect to see a significant three-way interaction. A significant interaction was to be followed by tests and comparisons of the simple slopes (see Cohen, Cohen, West & Aiken, 2003).

A four step hierarchical binary logistic regression was performed to test the effects of GPA, order, group, CCQ, and their interactions on the outcome variable reflecting whether or not participants found the anagram solution pattern (pattern). GPA, group, and order were entered in the first step, CCQ was entered in the second step, the two-way interactions were entered in the third step, and the three-way interaction was entered in the fourth step.

To test the effect of group and CCQ scores on the mood outcome a measured by the students' scores on depression subscale of the POMS, a regression analysis was run. The posttest scores for the depression subscale of the POMS were used as the outcome measure. The pretest scores of the depression subscale of the POMS were entered as the first covariate, order was entered second, group third, CCQ scores fourth. The two-way interactions were entered next, and finally, the three-way interaction of order, group and

CCQ was entered. If a significant interaction was found, then the simple slopes were again tested and compared.

PILOT STUDIES

Two pilot studies were completed before data collection for the final study was started. These studies included:

1. A planned pilot investigation aimed at fine-tuning the pretest tasks employed to induce learned helplessness, testing and adjusting the anagram tasks, and fine-tuning the entire computer program developed for the computerized experimental sessions.

2. A pilot study necessitated by evidence for contamination across study conditions, which was detected during the active data collection phase and that required a change in procedures.

Planned Pilot

In October of 2009, 24 participants from a USU creative arts class who had already completed the survey portion of the study came to the computer lab to complete the experimental portion of the study. After reading and signing the informed consent form, they were directed to a computer preconfigured for them and instructed to log in. They then completed the experimental portion of the study consisting of the POMS pretest, 19 TetraVex puzzles, 20 anagrams, the POMS posttest, and the questionnaire on their experience with the TetraVex and anagram tasks. First, students' performance on the anagram task was inspected. Upon examination of the data it was evident that most of the participants from both groups were not attempting to correctly answer the anagrams. At this stage of development, the computer did not give them the option of moving on until the five letters that formed the anagram had been typed, but the letters

did not have to be in the correct order. The students figured this out very quickly. Many appeared to have spent just enough time to type the letters in some random order, often between 5 and 10 seconds. They would then hit the "Enter" key and move on to the next anagram. It was apparent that the participants were not putting in enough effort to be trying to find the correct answer. There was not a single participant who allowed the full 90 seconds to elapse for each of the anagrams they failed to solve.

To remedy the lack of effort displayed by participants in solving the anagrams, two changes were made. First, the "Enter" option was taken away. The computer moved on without "Enter" being pressed as soon as the correct answer to the anagram was keyed in. Doing this permitted removal of the option for students to move on without finding the correct solution. The second change implemented was to create a recorded demonstration of how to solve the anagrams using a colorful background. This same background was added to the screen viewed by the participants while solving anagrams on their own. Before the completion of the first pilot study, the window in which anagrams were solved was just a small box centered on the screen with black text, a white background, and a blue bar across the top of the window. It was thought that by making the anagrams appear more professional like the TetraVex, participants would take them more seriously.

Unplanned Pilot

After completion of the first four sessions of what was supposed to be the main study, the data was examined. Upon evaluation of the qualitative data, it became apparent that students who had already completed the study were discussing their

experience with students who had not yet done the study. We got eight comments from participants in the second through the fourth sessions indicating that they knew that the puzzles were unsolvable. In addition, data from the participant experience questionnaire showed that the later sessions had more people commenting that the puzzles were not solvable than the earlier sessions. The third and fourth sessions each had three people who commented that the puzzles were not solvable. This was roughly 25% of those in the treatment group. As a final piece of evidence for the apparent contamination, one participant in the control group (who actually received solvable puzzles) stated "I…thought that all of the puzzles were impossible (done this way for study purposes). If I would have known that they were solvable I would have enjoyed it more." This comment clearly indicated that the participant was not commenting on his or her own experience with the anagrams, but repeated what he/she had heard about the study. Deliberate efforts had been made to ensure that most of the TetraVex puzzles presented to the control group were as easy as possible. The comment from the participant in the control group indicating that the puzzles were not solvable combined with the increasing number of participants per session commenting that they knew the puzzles were not solvable provided sufficient evidence to indicate that the sample had been contaminated. It was decided that the data from all sessions completed after the first session would have to be thrown out. Additionally, a new, uncontaminated sample would have to be recruited. Up to this point, the entire sample had come from a single creative arts class. A new sample was recruited from a combination of a second creative arts class, and two undergraduate psychology courses. To slow the spread of information by word of mouth from participant to participant, it was decided that data collection from any given class

would have to be both started and completed between any two meetings of the class. This was executed by conducting all of the data collection sessions during a single weekend.

RESULTS

There were 80 participants who completed the experimental session with the first order, and 167 participants who completed the experimental session with the second order. Of the 80 participants who completed the anagram task before proceeding on to the POMS, 74 were successfully matched together. The remaining six were not able to be matched to another participant, but they were still randomly assigned to a group and retained in the sample. Of the 167 participants who took the POMS posttest before completing the anagram task 160 were successfully matched together and randomly assigned to either treatment or control. The remaining seven were not able to be matched to another participant, but were still randomly assigned to a group and retained in the sample.

Preliminary Data Analysis

Qualitative Data Check

The data was checked for validity based on possible contamination by foreknowledge that puzzles may be unsolvable. In the qualitative data for all 247 participants, one participant said that the TetraVex puzzles were impossible, and one indicated that the task was rigged. Both of those participants were in the treatment group. One other participant indicated that some of the anagrams could not be rearranged to form English words. Overall, there was no evidence of contamination.

Additionally, the qualitative data were examined to ascertain whether or not the students seemed to take the puzzles seriously. When asked whether they were concerned

about the future performance in college after their experiences playing TetraVex and solving the anagrams, 21 comments were received suggesting that the participants felt that these puzzles cannot adequately predict college success or that they are worried for kids who will someday take the SAT or ACT with these tests included on it. Additionally, of the 123 participants in the treatment group, 93 indicated that they were not concerned about their future ability to succeed in college, 6 expressed a little concern, and 19 expressed concern. The remaining 3 commented on the stupidity of using the TetraVex and anagram tasks on the SAT or ACT rather than commenting on whether or not they were concerned about their future ability to succeed in college.

Randomization Check

The data was checked to ensure the success of the randomization. The randomization check indicated that there were no statistically significant differences between groups on age, number of hours worked per week, number of children, CCQ scores, or CES-D scores (see Table 4). The control group showed slightly higher values for age, number of hours worked, number of children, and CCQ scores, while the treatment group showed slightly higher values for depression, but none of the group differences were great enough to be statistically significant (see Table 5). Additionally, the assumption of homogeneity of variances was met on each of the variables (see Table 6). Next, the categorical variables of gender, marital status, religion, last grade completed in school, ethnicity/race, living arrangement, and high school grade point average (GPA) were checked for group differences using chi-square tests. Statistically

Table 4

ANOVA of Initial Group Differences on Continuous Variables

Demographic variable		*SS*	*df*	*MS*	*F*	Sig.
Age	Between groups	52.646	1	52.646	2.586	.109
	Within groups	4987.095	245	20.355		
	Total	5039.741	246			
Hours worked (per week)	Between groups	180.980	1	180.980	1.150	.285
	Within groups	38389.724	244	157.335		
	Total	38570.703	245			
Number of children	Between groups	.187	1	.187	.230	.632
	Within groups	199.092	245	.813		
	Total	199.279	246			
CCQ	Between groups	28.628	1	28.628	.251	.617
	Within groups	27953.413	245	114.096		
	Total	27982.040	246			
CES-D	Between groups	136.481	1	136.481	1.286	.258
	Within groups	26004.637	245	106.141		
	Total	26141.117	246			

Note. CCQ = Coping Competence Questionnaire; CES-D = Center of Epidemiological Studies Depression scale.

significant group differences were found only for high school GPA, with those in the treatment group having higher GPAs on average than those in the control group (see Table 7). To account for this group difference, GPA was added as a covariate for the statistical tests run on the outcome performance measures. None of the other variables had statistically significant group differences.

Table 5

Descriptive Statistics for Randomization Check on Continuous Background Variables

Variable	Group	*N*	Mean	*SD*
Age	Control	124	21.43	5.038
	Treatment	123	20.50	3.910
	Total	247	20.97	4.526
Hours worked per week	Control	123	11.30	13.506
	Treatment	123	9.59	11.500
	Total	246	10.44	12.547
Number of children	Control	124	.23	.873
	Treatment	123	.17	.930
	Total	247	.20	.900
CCQ	Control	124	51.2500	10.32057
	Treatment	123	50.5691	11.03354
	Total	247	50.9109	10.66528
CES-D	Control	124	13.8629	9.78827
	Treatment	123	15.3496	10.79616
	Total	247	14.6032	10.30848

Note. CCQ = Coping Competence Questionnaire; CES-D = Center of Epidemiological Studies Depression scale.

Table 6

Test of Homogeneity of Variances on Continuous Variables

Variable	Levene statistic	*df*1	*df*2	Sig.
Age	2.293	1	245	.131
Hours worked per week	1.117	1	244	.292
Number of children	0.647	1	245	.422
CCQ	0.689	1	245	.407
CES-D	1.125	1	245	.290

Note. CCQ = Coping Competence Questionnaire; CES-D = Center of Epidemiological Studies Depression scale.

Table 7

Frequency Counts and Chi Square Tests for Categorical Variables

Variable	Group		Total	Chi-Square
	Control	Treatment		
Gender				χ^2 (1,246) = .00, p = .95
Males	61	60	121	
Females	63	63	126	
Total	124	123	247	
Marital Status				χ^2 (1,246) = .83, p = .36
Single	105	109	214	
Married	19	14	33	
Total	124	123	247	
Religion				χ^2 (2,246) = 1.51, p = .47
LDS	97	100	197	
Other	10	12	22	
Not religious	17	11	28	
Total	124	123	247	
Last grade completed				χ^2(4,243) = 4.13, p = .39
High School or GED	57	58	115	
Freshman	41	29	70	
Sophomore	18	22	40	
Junior	6	11	17	
Senior	2	3	5	
Total	124	123	247	
Race/ethnicity				χ^2(1,246) = 0.54, p = .46
White	114	116	230	
Other	10	7	17	
Total	124	123	247	
Living arrangement				χ^2(5,242) = 5.44, p = .37
Alone	8	8	16	
Parents	24	17	41	
Room mates	67	81	148	
Spouse	10	10	20	
Spouse & child(ren)	9	4	13	
Other	6	3	9	
Total	124	123	247	
High school GPA				χ^2(3,244) = 9.89, p = .02*
0.00-2.50	5	3	8	
2.51-3.00	9	16	25	
3.01-3.50	31	14	45	
3.51-4.00	77	90	167	
Total	122	123	245	

* $p \leq .05$.

Primary Analyses

Anagrams

Analysis of total amount of time to complete anagram task. A hierarchical regression was performed with time needed to complete the anagrams as the dependent variable, entering GPA, group, and order step 1, CCQ in step 2, the two-way interactions between group, order and CCQ in step 3, and finally the three-way interaction of group, order and CCQ in step 4. In the fourth model, which included all of the main effects and interactions, results indicated a statistically significant main effect of group, $\beta = .14$, $p = .04$, suggesting that those in the control group solved the anagrams faster than those in the treatment group (see Table 8). Additionally, the effect of GPA was statistically significant, suggesting that those with higher GPAs solved the puzzles more quickly $\beta = -.19$, $p \leq .01$. The effects of order, $\beta = .02$, $p = .74$, and CCQ, $\beta = -.07$, $p = .31$, were not statistically significant. None of the two-way interactions were statistically significant, CCQ * group, $\beta = -.12$, $p = .06$, CCQ * order, $\beta = -.11$, $p = .10$, and group * order, $\beta = -.11$, $p = .10$. An overall $R = .32$, accounting for 10% of the variance in the total amount of time needed to complete the anagram task, resulted (see Table 9).

The three-way interaction between CCQ, group, and order on the time required to complete the anagram task was also statistically significant. The simple interaction of CCQ*group for those who completed the anagrams first, $\beta = -.255$, $SE = .092$, $p = .014$, was statistically significant. The simple interaction of CCQ*group for those who completed the POMS first, $\beta = .010$, $SE = .080$, $p =$ ns, was not significant. The graphs of the simple slopes (see Figure 1) indicate that among participants who completed the

Table 8

*Hierarchical Regression for GPA, Group, Order, CCQ Scores, CCQ*Group, CCQ*Order, Group*Order, and CCQ*Group*Order on the Total Amount of Time Needed to Complete the Anagram Task*

		Coefficients				Collinearity statistics	
Model	Predictor	*B*	Std. Error	*t*	Sig.	Tolerance	VIF
1	Constant	.00	.07	.06	.95	----	----
	GPA	-.20	.06	-3.17	.00**	1.00	1.00
	Group	.11	.06	1.69	.09	1.00	1.00
	Order	.01	.07	.16	.88	1.00	1.00
2	Constant	.00	.07	.05	.96	----	----
	GPA	-.20	.06	-3.22	.00	1.00	1.00
	Group	.10	.06	1.64	.10	1.00	1.00
	Order	.01	.07	.21	.84	1.00	1.00
	CCQ	-.11	.06	-1.71	.00	1.00	1.00
3	Constant	.00	. 07	.03	.97	----	----
	GPA	-.20	.06	-3.11	.00**	.98	1.02
	Group	.14	.07	2.17	.03*	.87	1.15
	Order	.01	.06	.22	.82	1.00	1.00
	CCQ	-.07	.07	-1.09	.28	.91	1.10
	CCQ*group	-.08	.06	-1.30	.19	.99	1.01
	CCQ*order	-.10	.07	-1.47	.14	.91	1.10
	Group*order	-.11	.07	-1.67	.10	.86	1.17

(*table continues*)

		Coefficients				Collinearity statistics	
Model	Predictor	*B*	Std. Error	*t*	Sig.	Tolerance	VIF
4	Constant	-.00	.07	-.04	.97	----	----
	GPA	-.19	.06	-3.09	.00**	.98	1.02
	Group	.14	.07	2.12	.04*	.87	1.15
	Order	.02	.07	.33	.74	1.00	1.00
	CCQ	-.07	.06	-1.02	.31	.91	1.11
	CCQ*group	-.12	.06	-1.89	.06	.90	1.11
	CCQ*order	-.11	.06	-1.65	.10	.91	1.10
	Group*order	-.11	.07	-1.66	.10	.86	1.17
	CCQ*group*order	.14	.07	2.16	.03*	.91	1.10

* $p \leq .05$, ** $p \leq .01$; All outcome measures and nondichtomous predictors have been standardized; Group: -1 = control group, 1 = treatment group; CCQ = Coping Competence Questionnaire; Order -1 = Anagrams then POMS, 1 = POMS then Anagrams.

Table 9

*Regression Model Fit for: GPA, Group, Order, CCQ Scores, CCQ*Group, CCQ*Order, Group*Order, and CCQ*Group*Order on the Total Amount of Time Needed to Complete the Anagram Task*

					Change statistics				
Model	*R*	R^2	Adjusted R^2	Std. error of the estimate	R^2 change	*F* change	*df*1	*df*2	Sig. *F* change
1	.22	.05	.04	.98	.05	4.16	3	241	.01
2	.25	.06	.05	.98	.01	2.94	1	240	.09
3	.29	.09	.06	.97	.03	2.19	3	237	.09
4	.32	.10	.07	.96	.02	4.65	1	236	.03*

* $p \leq .05$

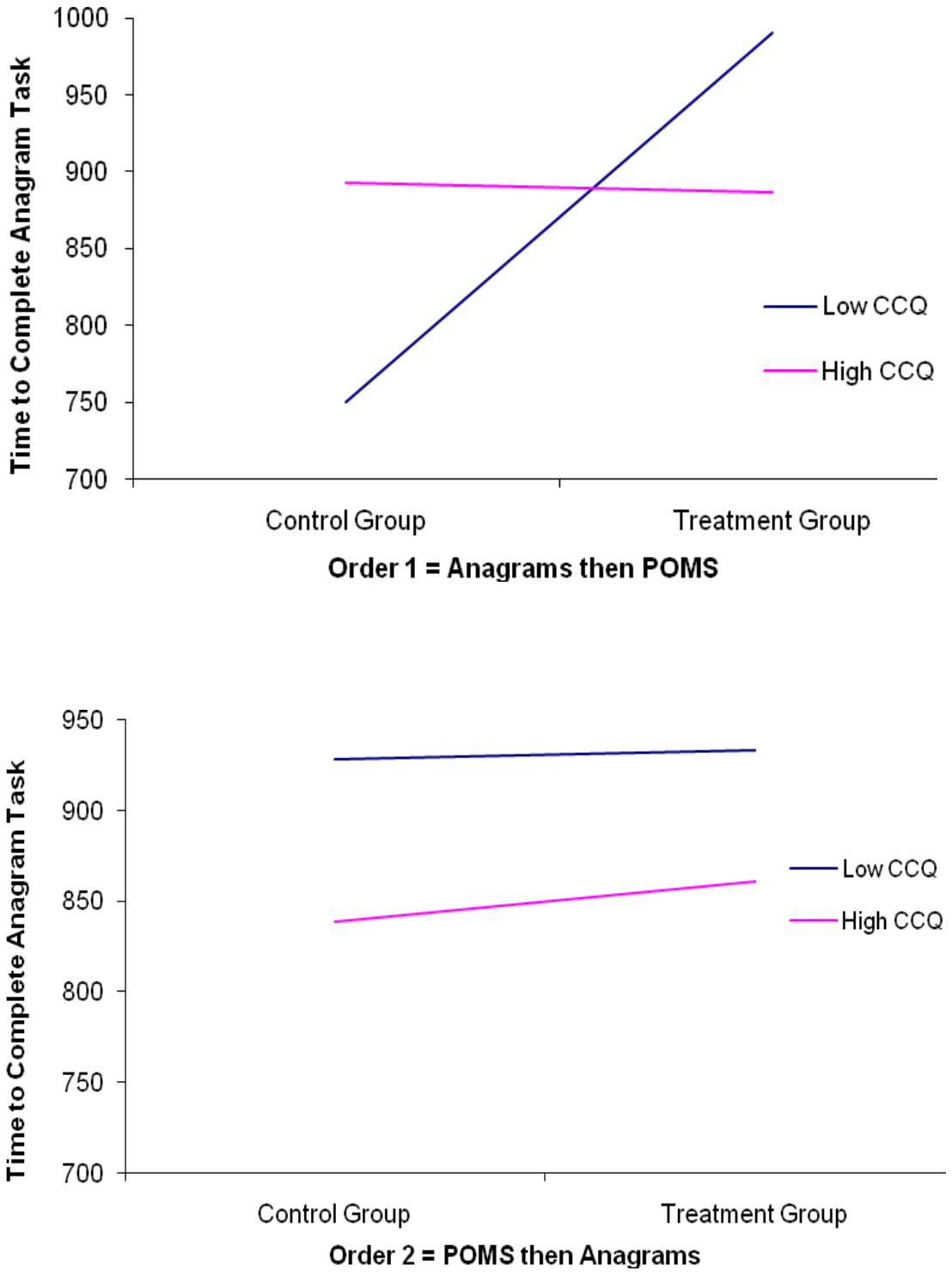


Figure 1. Three-way interaction between order (separate graphs), CCQ (separate lines), and group (x-axis) on the time required to complete the anagram task.

anagram task first followed by the POMS (order 1) those with high CCQ scores required a moderate amount of time to complete the anagram task regardless of whether they were in the treatment group or control group, while participants with low CCQ scores solved the anagrams quickly if they were in the control group and slowly if they were in the treatment group. The mean for the treatment group (see Table 10) was $M = 994.96$, $SD = 219.58$, and the mean for the control group was $M = 854.51$, $SD = 189.16$, with a SMDES of $d = .74$. Participants who completed the POMS first (order 2) showed no interaction between group and CCQ. Those with high CCQ scores solved the problems more quickly than those with low CCQ scores and it made no difference whether they were in the treatment or the control group. The mean for the treatment group was $M = 936.06$, $SD = 237.70$, and the mean for the control group was $M = 931.27$, $SD = 249.64$, with a SMDES of $d = .02$.

Total number of anagrams solved. A hierarchical regression was performed with the total number of anagrams solved as the dependent variable, entering GPA, group, and order in step 1, CCQ in step 2, the two-way interactions of group, order and CCQ in step 3, and finally the three-way interaction in the 4th step. In the fourth model, which included all of the main effects and interactions, results indicated a statistically significant main effects of group, $\beta = -.15$, $p = .03$, suggesting that those in the control group solved more anagrams than those in the treatment group, and GPA, $\beta = .20$, $p \leq .00$, suggesting that those with higher GPAs solved more anagrams (see Table 11). Order, $\beta = -.03$, $p = .61$, and CCQ, $\beta = .10$, $p = .14$, were not statistically significant. None of the two-way interactions were statistically significant. An overall $R = .35$,

Table 10

Means, Standard Deviations, and SMDES for the Total Amount of Time Needed to Complete the Anagram Task

Order	Treatment *n*	Treatment *M*	Treatment *SD*	Control *n*	Control *M*	Control *SD*	*d*
Anagrams then POMS	40	994.96	219.58	40	854.51	189.16	.74
POMS then Anagrams	83	936.06	237.70	84	931.27	249.64	.02

Table 11

*Hierarchical Regression for GPA, Group, Order, CCQ Scores, CCQ*Group, CCQ*Order, Group*Order, and CCQ*Group*Order on the Number of Anagrams Solved*

		Coefficients				Collinearity statistics	
Model	Predictors	*B*	Std. Error	*t*	Sig.	Tolerance	VIF
1	Constant	.00	.07	.01	.99	-----	-----
	GPA	.21	.06	3.31	.00***	1.00	1.00
	Group	-.10	.06	-1.77	.08	1.00	1.00
	Order	-.02	.07	-.31	.76	1.00	1.00
2	Constant	.02	.07	.03	.98	-----	-----
	GPA	.21	.06	3.38	.00***	1.00	1.00
	Group	-.11	.06	-1.70	.09	1.00	1.00
	Order	-.03	.07	-.38	.70	1.00	1.00
	CCQ	.13	.06	2.11	.02*	1.00	1.00
3	Constant	.00	.07	.01	1.00	-----	-----
	GPA	.20	.06	3.17	.00**	.98	1.02
	Group	-.15	.07	-2.30	.02*	.87	1.15
	Order	-.02	.07	-.38	.71	1.00	1.00
	CCQ	.10	.07	1.56	.12	.91	1.10
	CCQ*group	.02	.06	.26	.80	.99	1.01
	CCQ*order	.09	.06	1.38	.17	.91	1.10
	Group*order	.13	.07	1.89	.06	.86	1.17

(*table continues*)

		Coefficients				Collinearity statistics	
Model	Predictors	*B*	Std. Error	*t*	Sig.	Tolerance	Model
4	Constant	.01	.07	0.09	.93	-----	-----
	GPA	.20	.06	3.17	.00**	.98	1.02
	Group	-.15	.07	-2.24	.03*	.87	1.15
	Order	-.03	.07	-0.51	.61	1.00	1.06
	CCQ	.10	.06	1.49	.14	.91	1.10
	CCQ*group	.07	.06	1.06	.29	.90	1.11
	CCQ*order	.10	.06	1.62	.11	.91	1.10
	Group*order	.12	.07	1.89	.06	.86	1.17
	CCQ*group*order	-.18	.06	-2.75	.01**	.91	1.10

* $p \leq .05$, ** $p \leq .01$; All outcome measures and nondichtomous predictors have been standardized; Group: -1 = control group, 1= treatment group; CCQ = Coping Competence Questionnaire; Order -1 = Anagrams then POMS, 1 = POMS then Anagrams.

accounting for 12% of the variance in number of anagrams solved resulted (see Table 12).

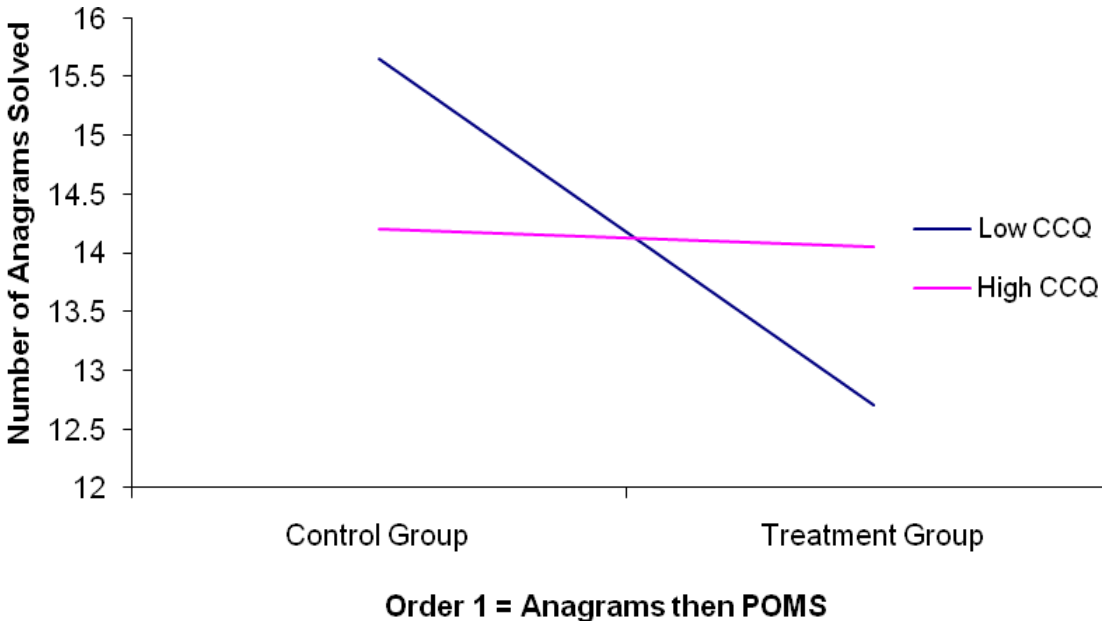
The three-way interaction between CCQ, group, and order on the number of anagrams solved was statistically significant, β = -.18, p = .01 (see Table 11). The graphs of the simple interactions (see Figure 2) indicate a statistically significant interaction between group and CCQ for the participants who completed the anagram task before the mood measure, β = .240 SE = .098, p = .034. Those participants with high CCQ scores correctly solved about 14 anagrams, on average, regardless of whether they were assigned to the treatment or control condition, while those with low CCQ scores solved on average about 15½ anagrams if they were in the control group, but only an average of about 12½ if they were in the treatment group. When the anagrams were measured before the POMS, the mean for the treatment group was M = 12.68, SD = 2.99, and the mean for the control group was M = 14.48, SD = 2.21, with a SMDES of d = .82 (see Table 13). The interaction between CCQ and group was not statistically significant for the participants who completed the mood measure prior to completing the anagram task, β = -.104, SE = .078, p = .376. The graph of this simple interaction indicated that participants in the treatment group with low CCQ scores solved more anagrams than those in the control group, but fewer than treatment group participants with high CCQ scores, and those in the control group with high CCQ scores correctly solved the most anagrams (see Figure 2). When the POMS was measured before the anagrams, the mean for the treatment group was M = 13.41, SD = 2.58, and the mean for the control group was M = 13.45, SD = 3.19, with a SMDES of d = .01 (see Table 13).

Table 12

*Regression Model Fit for: GPA, Group, Order, CCQ Scores, CCQ Scores, CCQ*Group, CCQ*Order, Group*Order, and CCQ*Group*Order on the Number of Anagrams Solved*

					Change Statistics				
Model	*R*	R^2	Adjusted R^2	Std. error of the estimate	R^2 change	*F* change	*df*1	*df*2	Sig. *F* change
1	.23	.05	.04	.98	.05	4.56	3	241	.00**
2	.27	.07	.06	.97	.02	4.47	1	240	.04*
3	.30	.09	.06	.97	.02	1.79	3	237	.15
4	.35	.12	.09	.95	.03	7.54	1	236	.01**

* $p \leq .05$; ** $p \leq .01$



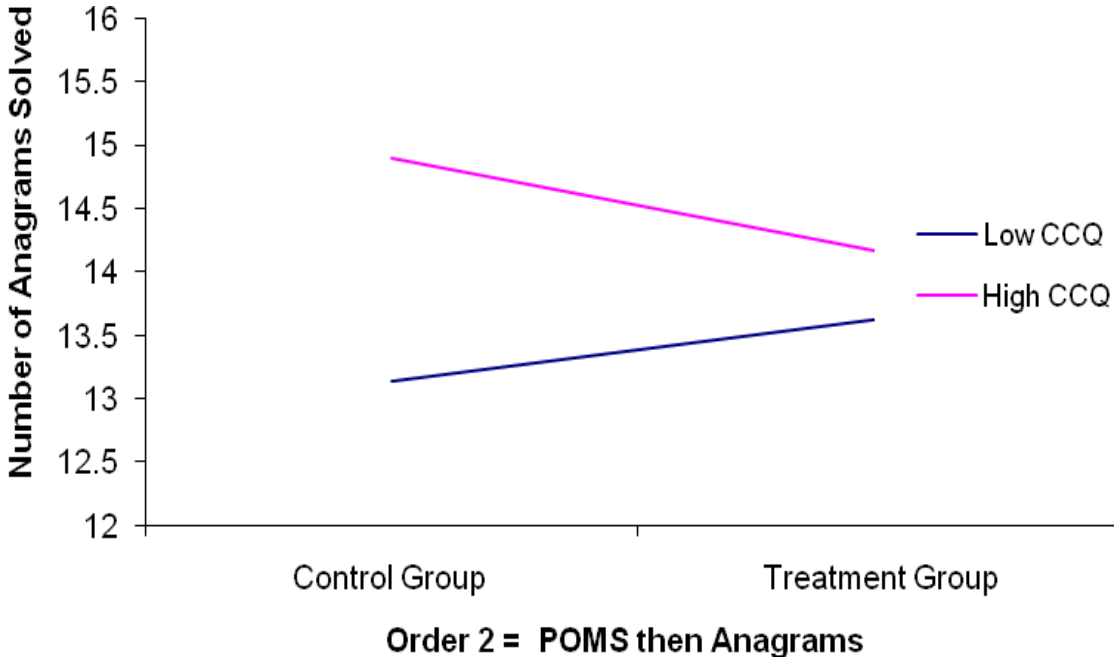


Figure 2. Three-way interaction between order (separate graphs), CCQ (separate lines), and group (x-axis) on number of anagrams solved.

Table 13

Means, Standard Deviations, and SMDES for the Number of Anagrams Solved

Order	Treatment *n*	Treatment *M*	Treatment *SD*	Control *n*	Control *M*	Control *SD*	*d*
Anagrams then POMS	40	12.68	2.99	40	14.48	2.21	.82
POMS then Anagrams	83	13.41	2.58	84	13.45	3.19	.01

Pattern detection. A four-step hierarchical logistic regression was performed with recognition of the anagrams solution pattern as the dependent variable, entering GPA, group, and order in step 1, CCQ in step 2, the two-way interactions of group, order and CCQ in step 3, and finally the three-way interaction in the fourth step. None of the effects were statistically significant (see Table 14).

Depressed Mood

Means, standard deviations, and the test retest correlations of the depression subscale of the POMS for both the treatment and the control group are presented in Table 15. The test retest correlation was $r = .67$ for the treatment group, and $r = .87$ for the control group (see Table 15).

The data from the depression subscale of the POMS was extremely skewed. Square root, cube root, and log transformations all failed to acceptably adjust for the skew, so Poisson regression analysis was performed instead of normal regression analysis. The depression subscale of the POMS posttest was entered as the dependent variable. The analysis controlled for pretest scores on the POMS depression scale, experimental group, CCQ, and order of the dependent variables were entered as the main predictors. A full-factorial model was tested including all two-way interactions and the three-way interaction between CCQ, experimental group, and order of the dependent variables. The omnibus, χ^2 (8, 239) = 1263.08, $p = .000$, suggested that the predictors, taken together achieved a highly significant improvement in model fit (see Table 16). There were statistically significant main effects of group, $B = .488$, $p = .000$, indicating that participants in the control group faced lower levels of depress mood than those in the

Table 14

Binary Logistic Regression Result of GPA, Group, Order, CCQ, and Interactions of CCQ and Group, CCQ and order, and Group and Order on Whether or Not Participants Discovered Anagram Solution Pattern

Predictors	*B*	S.E.	Wald	*df*	Sig.	Exp B
GPA	.26	0.36	.54	1	.46	1.30
Group	-2.22	6.50	.12	1	.73	.11
Order	1.82	6.50	.08	1	.78	6.15
CCQ	.11	6.04	.00	1	.99	1.12
CCQ*group	.04	6.04	.00	1	1.00	1.04
CCQ*order	.21	6.04	.00	1	.97	1.23
Group*order	1.39	6.50	.05	1	.83	4.01
CCQ*group*order	-.06	6.04	.00	1	.99	.94
Constant	-4.78	6.5	.54	1	.46	.01

Note. All outcome measures and nondichtomous predictors have been standardized; Group: -1 = control group, 1 = treatment group; CCQ = Coping Competence Questionnaire; Order -1 = Anagrams then POMS, 1 = POMS then Anagrams.

treatment group, CCQ, β = -.188, p = .000, indicating participants with high CCQ scores had lower levels of depressed mood than those with low CCQ scores, and pretest, B = .058, p = .000, indicating that those with higher levels of depressed mood on the pretest also had higher levels of depressed mood on the posttest, and those with lower pretest levels of depress mood also showed lower levels on the posttest (see Table 17). The two-way interaction between CCQ and group, B = .159, p = .000, and the two-way

Table 15

Means, Standard Deviations, and Test Retest Correlations for the Depression Subscale of the POMS Pretest and Posttest

Group	*n*	Pretest *M*	Pretest *SD*	Posttest *M*	Posttest *SD*	Test retest *r*
Treatment	123	6.86	8.66	9.02	9.18	.67
Control	124	4.65	7.12	3.23	6.31	.87

Table 16

Omnibus Tests of Model Coefficients with POMS Depression Subscale Posttest as the Dependent Variable, and the Pretest of the Depression Subscale of the POMS, Order, CCQ, and Group as Predictors

Likelihood ratio Chi-square	*df*	Sig.
1263.08	8	.000

interaction between order and group, $B = .083$, $p = .025$, were also both statistically significant.

The graph of the simple slopes for the interaction between CCQ and group (see Figure 3) indicates a greater effect of CCQ in the control group, $B = -.121$, $SE = .0591$, $p = .040$ one-tailed, than in the treatment group, $B = -.095$, $SE = .0345$, $p = .006$, one-tailed. Participants with high CCQ scores reported lower levels of depressed mood than those with low CCQ scores. Among members of the experimental group, depression scores were generally high and apparently unaffected by participants' CCQ scores.

Simple slopes were calculated to graph the interaction of experimental group and order of presentation of test tasks. The interaction between order and group indicates that the effects of experimental group on depressed mood are substantially stronger when the POMS is presented first (see Figure 4). Participants in the treatment group experienced statistically significantly higher levels of depressed mood when the POMS was first as opposed to when the anagrams were presented before the POMS, $B = -.128$, $SE = .0375$, $p = .002$ two tailed. However, participants in the control group experienced lower levels

Table 17

*Poisson Regression of Pretest of the Depression Subscale of the POMS, Group, Order, CCQ Scores, CCQ*Group, CCQ*Order, Group*Order, and CCQ*Group*Order on the Posttest of the Depression Subscale of the POMS*

			95% Wald confidence		Hypothesis test		
Parameter	*B*	Std. Error	Lower	Upper	Wald chi-square	*df*	Sig
Intercept	1.092	.043	1.007	1.176	638.531	1	.000
Pretest POMS depression subscale	.058	.003	.053	.063	492.533	1	.000***
Order	.032	.037	-.041	.105	.748	1	.387
Group	.488	.037	.416	.561	173.197	1	.000***
CCQ	-.188	.032	-.251	-.125	34.675	1	.000***
Group*CCQ	.159	.026	.109	.210	38.133	1	.000***
Order*CCQ	-.019	.027	-.071	.033	.517	1	.472
Order*group	.083	.037	.011	.155	5.041	1	.025*
Order*group*CCQ	.034	.027	-.017	.085	1.695	1	.193

* $p \leq .05$, *** $p \leq .001$; All outcome measures and nondichtomous predictors have been standardized; Group: -1 = control group, 1 = treatment group; CCQ = Coping Competence Questionnaire; Order -1 = Anagrams then POMS, 1 = POMS then Anagrams.

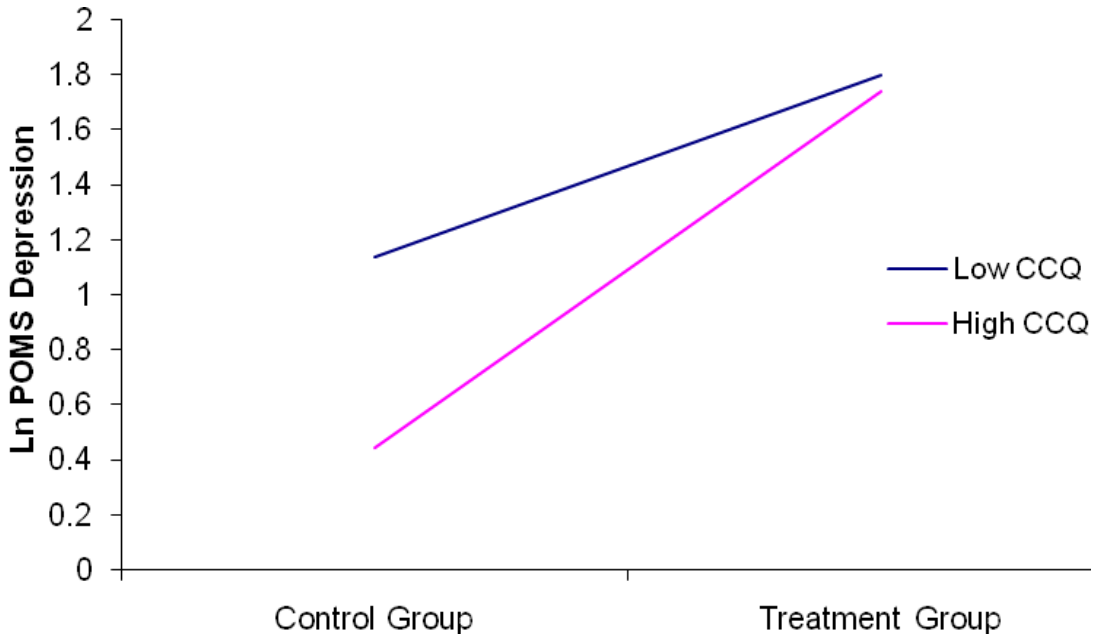


Figure 3. Two-way interaction between CCQ and group on standardized depression levels as measured by the POMS.

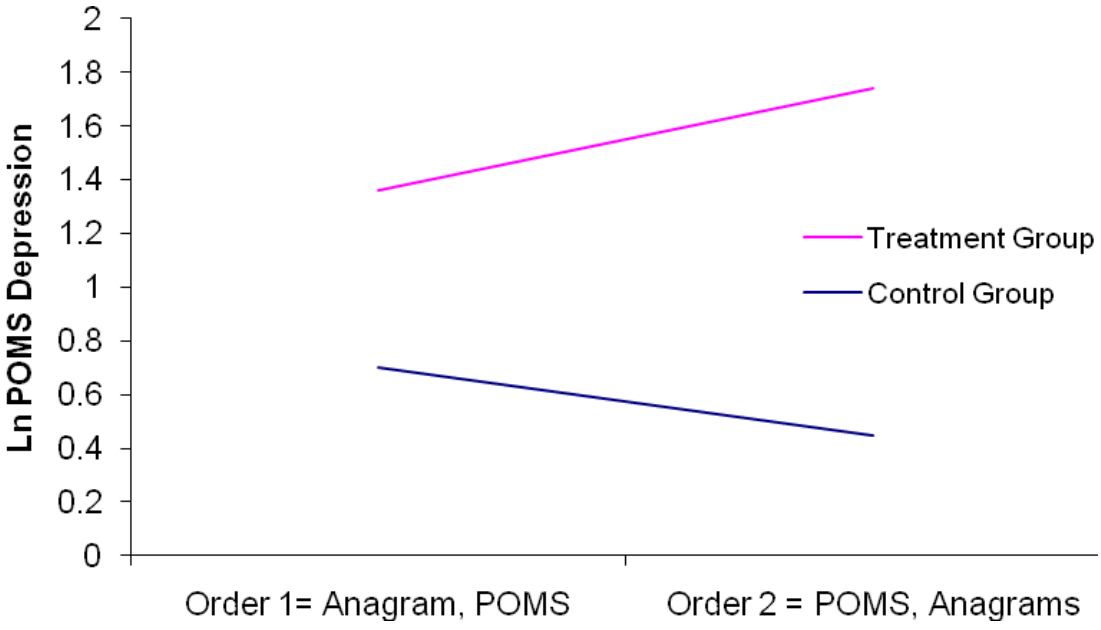


Figure 4. Two-way interaction between order and group on standardized depression levels as measured by the POMS.

of depressed mood when the POMS was first as opposed to when the anagrams were first.

DISCUSSION

Hypothesis 1 claimed that participants exposed to repeated failure will develop helplessness deficits in terms of reduced performance on another task and in terms of depressed mood. For every outcome measure other than anagram pattern recognition, a statistically significant main effect of group was found (see Tables 8, 11, and 17). In all three cases, the effect of group was in the hypothesized direction. Those in the control group who had not been exposed to failure on the TetraVex puzzles performed better and showed lower levels of depressed mood than those in the treatment group who had been exposed to failure on the TetraVex puzzles. This indicates that overall, the TetraVex task was useful in inducing helplessness deficits, and the first hypothesis appears to be true.

We did not anticipate being able to greatly manipulate the moods of the participants in either the failure group or the success group. The literature indicated a test retest correlation of .74 for the POMS depression subscale when the tests were an average of 20 days apart (McNair et al., 1992). Our pretest and posttest were given with at most 32 minutes between the completion of the pretest and the beginning of the post test for those who did the POMS before the anagrams, and at most 66 minutes for those who did the anagrams before the POMS. Even with ours so close together we still found a test retest correlation of only .67 among the participants exposed to failure on the TetraVex task, while we found a test retest correlation of .87 among participants exposed to success (see Table 15).

Remarkably, for most of the outcomes, the order in which the dependent measures were completed interacted with the effects of the experimental condition. The effect of

the experimental manipulation, as measured with the depression subscale of the POMS, was stronger for participants who completed the POMS immediately following the experimental manipulation (first POMS, then Anagrams) as indicated by the statistically significant two-way interaction of order and group (see Figure 4). Control group participants who completed the outcomes in this order experienced lower levels of depressed mood than control group participants from the first order. Further, treatment group participants who completed the POMS first experienced higher levels of depressed mood than treatment group participants who first completed the anagrams (anagrams, then POMS). This makes sense given that for these participants mood was tested immediately after their exposure to either success or failure with the TetraVex task, thus preventing any effects on mood from being lessened by success or failure on the anagram task. As exemplified by failure to induce helplessness by Tennen and associates (1982) when participants were given the opportunity to succeed on example problems similar to those of the test task, the introduction of any success can lessen the effects of helplessness deficits seen in the participants. Our data indicate that learned helplessness deficits in terms of depressed mood were induced on participants who completed the POMS directly following failure induction, and that this sequence of events (first POMS, then anagrams) may be more effective at inducing learned helplessness deficits as measured by the POMS depression subscale because there was no opportunity for participants to have experienced any intermediate successes.

Further, there is evidence to suggest that for participants who completed the POMS outcome measure first, followed by anagrams, helplessness deficits may have been transient and not have transferred to the performance measures. When the anagrams

were completed before the POMS, the SMDES we received for both the amount of time needed to complete the anagram task, $d = .74$, and the number of anagrams solved, $d = .82$, were consistent with the literature, $d = .72$, and $d = .76$, respectively (see Table 10). However, when the POMS was completed before the anagrams we found no effect what so ever (see Table 13). These data indicate that the first order of the outcome measures, anagrams followed by the POMS may potentially be more effective for the induction of learned helplessness deficits on performance as measured by the anagram task.

There is no clear answer as to why, when participants completed the POMS prior to completing the anagrams, learned helplessness deficits did not seem to transfer well to the performance task. One possibility is that even the small passage of time during the POMS administration may have erased effects the success or failure effects of the TetraVex puzzles on the anagram performance. Another possibility is that college students are reasonably informed, and our participants knew they were participating in a psychological study, so they would likely have expected us to manipulate them somehow. Also, perhaps by completing two mood assessments within an average of about 45 minutes of each other, the participants became suspicious and were alerted to the fact that our study was not really being conducted for the stated purpose of validating the TetraVex and anagram tasks for future inclusion on the SAT or ACT. Abramson and colleagues (1978) said with regard to learned helplessness theory, that if people do not believe that the causes of their failures will generalize to other aspects of life, the deficits will also not tend to generalize to other areas of life, and that if someone believes the results of the failure will not be long-lasting, then the deficits will also not be long

lasting. Completing the second mood survey within such a short period of time could potentially have lead the participants to believe that their performance on the tasks was not as important as we had claimed because it would not actually comment on their likelihood of success in college. This could in turn decrease the urgency with which they attempted to solve the anagrams and therefore decrease the strength of any potential helplessness deficits resulting from failure at the TetraVex task.

Hypothesis 2 claimed that coping competence would predict helplessness deficits beyond the effects of experimental manipulation. Interestingly, this hypothesis was supported for mood but not performance (see Table 17). The CCQ remained highly significant in an analysis controlling for group, POMS pretest, order or presentation of dependent measures, and the diverse interactions. This means that on the POMS depression subscale, the CCQ was able to predict outcome levels beyond what was expected based upon the experimental manipulation. However, no main effects of the CCQ on performance were detected. According to Schroder (2004) main effects of the CCQ are not necessarily expected because the primary function of the CCQ is to moderate the relationship between learned helplessness deficits and stress or failure at important tasks. Perhaps the reason no main effects of the CCQ were found with regard to the number of anagrams solved or the amount of time required to complete the anagram task was because coping competence functioned here as the theory suggested it should have, by moderating the effects of repeated failure on performance.

This interaction between experimental manipulation and coping competence was the focus of Hypothesis 3, claiming that coping competence would moderate the effects of failure on learned helplessness deficits. In other words, we expected that helplessness

deficits would be more pronounced among participants with low CCQ scores and diminish among those with high CCQ scores.

The statistically significant two-way interaction between CCQ and group on the posttest of the POMS depression subscale was different than we had hypothesized. The interaction plot (see Figure 3) indicates that there was very little difference in levels of depressed mood between treatment group participants with low CCQ scores and those with high CCQ scores. This, however, was not the case among participants in the control group. Among control group participants, those with high CCQ scores displayed much lower levels of depressed mood than those with low CCQ scores. This suggests that the CCQ was a good predictor of depressed mood among participants in the control group, but not among participants in the treatment group. Participants in the treatment group, regardless of their CCQ scores had much higher levels of depressed mood than participants with either CCQ level in the control group, indicating an overwhelming effect of failure induction on increases in depression that could not be buffered by the CCQ.

The interaction we found between CCQ scores and group on depressed mood was not supported by the literature, therefore many questions remain to be studied before we can fully understand and appreciate the interaction that has occurred. Because it is unknown why this interaction turned out the way it did, and will remain unknown until further research has been conducted to illuminate this quandary, we can only hypothesize as to what occurred. One possibility is that people require a bit of time to employ their coping strategies to deal with their moods. As moods often display a transient nature, it is possible that differences between people with high and low coping skills may only

occur after a period of time. In other words, it may be that it is the time that is needed to recover from a depressed mood that is affected by the CCQ rather than the immediate reaction.

For two of the three performance measures, the amount of time required to complete the anagram task and number of anagrams solved, we found a statistically significant three-way interaction between group, CCQ scores and the order in which the outcome measures were completed. Once again, in both of these interactions we found effects only if the dependent variable under investigation was presented immediately after the experimental manipulation (see Figures 1 and 2). As expected, for people with high CCQ scores, the experimental manipulation had no effect whatsoever on performance, indicating a very nice buffer effect on performance. In contrast, only among those with low CCQ scores was performance affected by repeated failure. The only question remaining is why people low in coping competence in the control group performed somewhat better than those with high CCQ scores. One possible solution to this question is that people who are low in coping competence are anxious to avoid failure because it has such devastating effects on their self-esteem. They may, therefore have exerted a greater effort in solving the tasks than those high in coping competence who are less anxious to avoid failure.

Finally, the measure of performance that necessitated the evaluation of whether or not people discovered the anagrams solution pattern did not get statistical significance for any of the variables. This is quite likely because with only 13 people out of 247 discovering the pattern there was simply inadequate test power to detect anything with statistical tests. It may be that perhaps part of the reason more people did not discover

the pattern is that they had no idea that they ought to be looking for a pattern because they believed the computer was randomly scrambling the word. Additionally, if they believed that the point of the study really was to validate the TetraVex and anagram tasks for future inclusion on the ACT or SAT, then it would not make sense for there to be a pattern to the solutions because the test designers would not want to make any part of the ACT or SAT that easy to solve because people who have figured it out could alert others who have not taken the test to the existence of the pattern thus making the test useless in predicting future academic performance.

Limiting Factors

There are several factors that may potentially limit the usefulness of this study. First, the demographic range covered was fairly narrow. All of the participants were undergraduate university students. Most of them had quite good high school GPAs, were single, white, and lived with roommates. Additionally, most of them were LDS. With such a narrow range, the variances in CCQ scores are also likely to be more limited than those of the general population. Second, it is possible that helplessness was not successfully induced for some of them. Based upon the data, there is evidence to suggest that many of the students did not believe their performance on the TetraVex puzzles or the anagrams would be a good predictor of their likelihood of being successful in college. Additionally, because all of the participants received their extra credit regardless of how well they did on the study tasks, then if the extra credit was more important to them than the claim made that their performance on the study tasks would predict their future college success, then they may have still viewed the process as a success. If the

participants did not believe that their performance on the study tasks were important, then the theory would suggest that strength of the resulting learned helplessness deficits among the treatment group would not be great (Abramson et al., 1978). Finally, there is a strong possibility that at least some of the participants, especially in the treatment group, were alerted to the fact that we were trying to frustrate them rather than really test the puzzles, which consequently altered their outcome responses; thus rendering their responses invalid for what we were attempting to test.

Conclusions

Several conclusions may be drawn from the results of this study. The CCQ does appear to be useful in predicting learned helplessness deficits. First, it appears to be a moderator relationship between group and performance. As a moderator, high coping competence enabled participants who had been exposed to failure to still perform better on the tasks than the participants with lesser coping skills. Second, it appears to be useful in predicting levels of depressed mood among participants in the control group who were not exposed to complete failure but were still exposed to challenging tasks. It did not seem to be effective at predicting levels of depressed mood among the participants exposed to failure on the TetraVex tasks as effectively, at least not shortly after exposure to repeated failure, though there was a main effect indicting that those high coping skills seem to experience lower levels of depressed mood. Finally, the order in which the outcome measures are presented does seem to make a difference on both the performance outcomes and the mood outcome, with each showing stronger effects when tested first.

Future Research Questions

There are still many questions to be answered with regard to the CCQ, as this was the first experimental study in which it has been used. First, more research is needed to fully understand the implications of the CCQ with regard to depressed mood. Why did the CCQ seem to moderate levels of depressed mood more effectively among participants exposed to at least partial success than among participants who were exposed strictly to failure on the TetraVex puzzles, and likely some success on the anagrams? Would the direction of the interaction between group and CCQ scores on levels of depressed mood change if the POMS pretest was not administered? Additionally, more research is needed to know for certain that the differences between the two orders of administration of the outcome measures shown on the number of outcomes solved and the total amount of time required to complete the anagram task were truly due to the varied order in which the outcome measures were administered, if it was simply a result of sampling error, or if something else entirely was going on. If there truly is a difference in outcomes based upon the order of outcome measure administration, what exactly has caused these differences? Are they primarily a result of participants being alerted to the fact that the researchers were trying to frustrate them?

There are several questions for which data from a longitudinal study would be helpful in answering. How robust are the CCQ's predictive powers? How does the CCQ do at predicting longer term learned helplessness deficits? What are the details affecting the transition of learned helplessness deficits over time to serious bouts of depression. Finally, if it is known that someone has a propensity to develop learned helplessness

deficits, can they be taught alternative coping strategies to prevent the possible transition of those deficits into more serious depression?

Now that the basic reliability and validity of the CCQ as a moderator between repeated failure and performance has been demonstrated among college students, it would be interesting to apply the CCQ in experimental studies to several other populations who could have a greater stake in an intervention. One way to increase participants state in the intervention without having to change either the population or the basic design of the study is to tell the students that the amount of extra credit they will receive will be dependent upon their performance on the anagram and TetraVex tasks. One population which would be interesting study is high school students who want to apply to college. The CCQ could identify students who may be prone to demotivation if they encounter early failures in college. Similarly, the CCQ could be used to identify students prone to learned helplessness deficits in failure prone courses such as Math 1010 when the students are told that TetraVex and anagram puzzles are predictive of success in their class. Additionally, the CCQ could be a useful outcome moderator among students who need to take a math placement exam. If the math placement exam was to be used as the intervention by manipulating the exam so students would either succeed or fail, then the students taking the exam would have a great stake in their performance on it. Studying these populations could serve two purposes: First, to test the assumption that the effects of failure and coping competence are substantially stronger if performance on the test task actually matters; and second, in more applied settings, the CCQ could be used to identify students prone to learned helplessness so that interventions that

strengthen these students' coping competence and inoculate them against premature learned helplessness effects could be developed and applied.

There are many possible applications for future research with the CCQ. Whenever proneness towards learned helplessness can be expected to diminish one's ability to cope with failure, negative life events, or chronic stress conditions, the ability of the CCQ to predict behavioral and emotional outcomes could be tested to determine whether it moderate the outcome and whether it is useful in identifying individuals who may benefit from cognitive-behavioral interventions. For example, the CCQ may help identify parents of children who suffer from a disability, chronic pain, or a chronic disease, who may benefit from an intervention to help them cope with and successfully adapt to the challenges they face. Finally, it would be interesting to evaluate the diagnostic abilities of the CCQ on dieting, chronic pain, chronic disease, and pain catastrophization populations.

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APPENDICES

Appendix A. Materials Used in Computer Portion of Phase 2

Introduction Slide

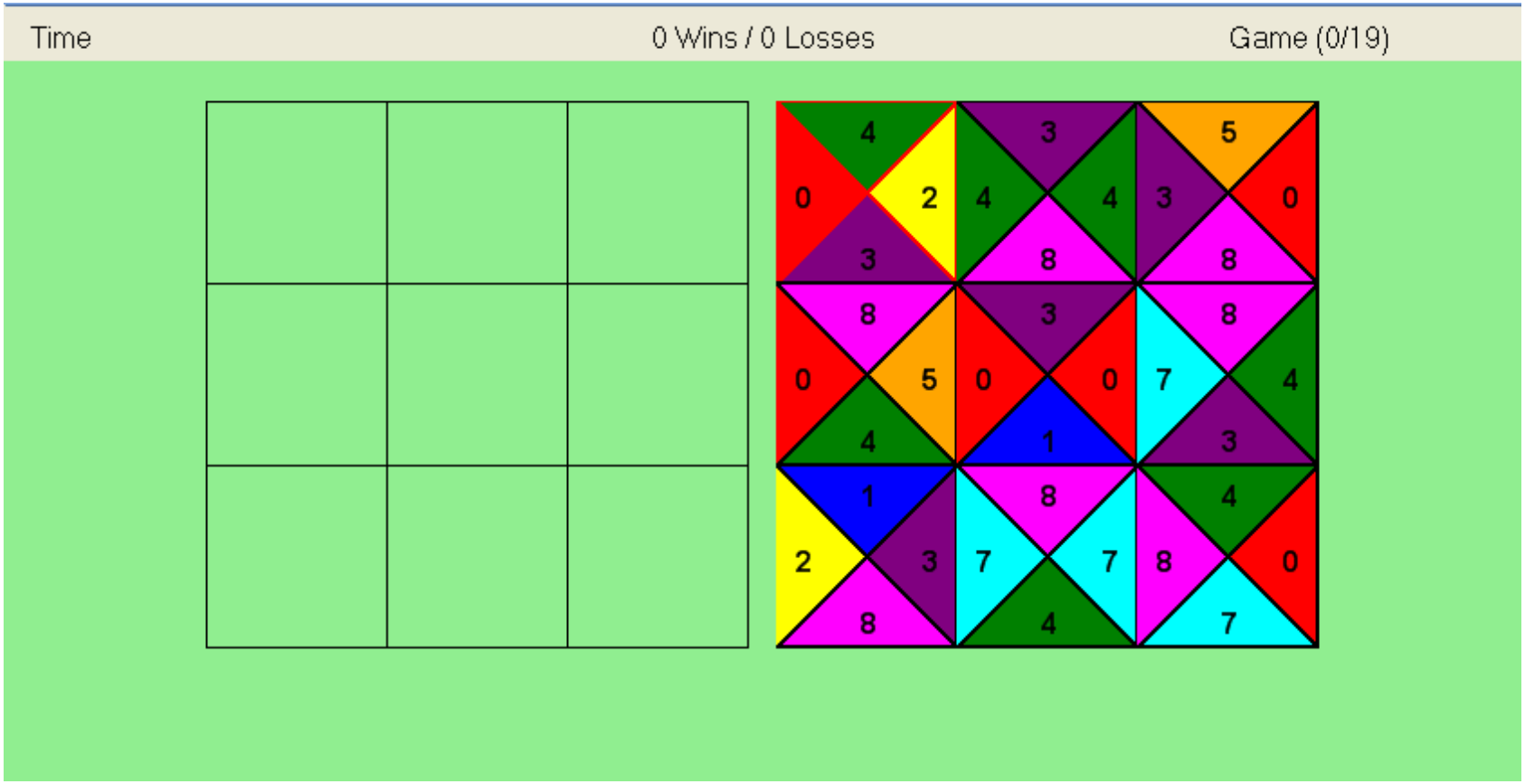
You are about to engage in a very important research study to critically evaluate the utility of some problem solving tasks that are supposed to predict academic success for college students. These tasks are currently being considered for inclusion in future versions of the SAT or the ACT.

In order to evaluate these tasks you will be asked to:

1. Complete a short survey
2. Play Tetravex
3. Unscramble some five letter words
4. Complete two more short surveys

Thank you for your willingness to aid us in this important study.

TetraVex Demonstration Slide



Script for TetraVex Demonstration

This is TetraVex. The object of the game is to move all of the tiles from the right matrix (indicate) where the tiles can go anywhere to the left matrix (indicate) where each number face of each of the tiles is required to touch only a similar number face on the adjacent tile. You will have 90 seconds to solve each puzzle. To move a tile, select it by clicking on it. When a game begins, the top left tile (indicate top left square) of the right matrix will automatically be selected. When a tile is selected it will have red lines (indicate red lines) separating the numbers as seen here, rather than the black lines (indicate black lines in another tile) seen everywhere else. To unselect a tile simply click on any other tile (demonstrate clicking on a tile to unselect top left tile). See, the top left tile is unselected now so I may select another tile (select 8347). Once a tile is selected, click in the square you want to move it to. For example, if this (move it to middle square) were the middle tile, it would have to have this tile (indicate 8477 then select it and move it to row 2 column 1 of left matrix) to its left because that is the only tile with a 7 on the right side to match up with the 7 on the left side of the middle tile. The tile that goes above the middle tile would have to have an 8 on the bottom because the middle tile has an 8 on the top. The computer will not permit you to put any tile into the left matrix unless all adjacent tiles have a number face that is identical to the tile you are trying to place there. For example, if I try to put this (4320) tile above the middle tile the computer will simply unselect it. (Try putting a tile that does not have an 8 on the bottom above the middle tile)

Notice that there are three different tiles with 8's on the bottom (indicate the three tiles with the cursor). It may initially appear as though any one of these three tiles would work, but there is never more than one unique solution to any given puzzle so you must figure out which of the three tiles that fit here will allow all of the other tiles to fit into the matrix too.

When all of the tiles have been successfully placed in to the left matrix you have won the game.

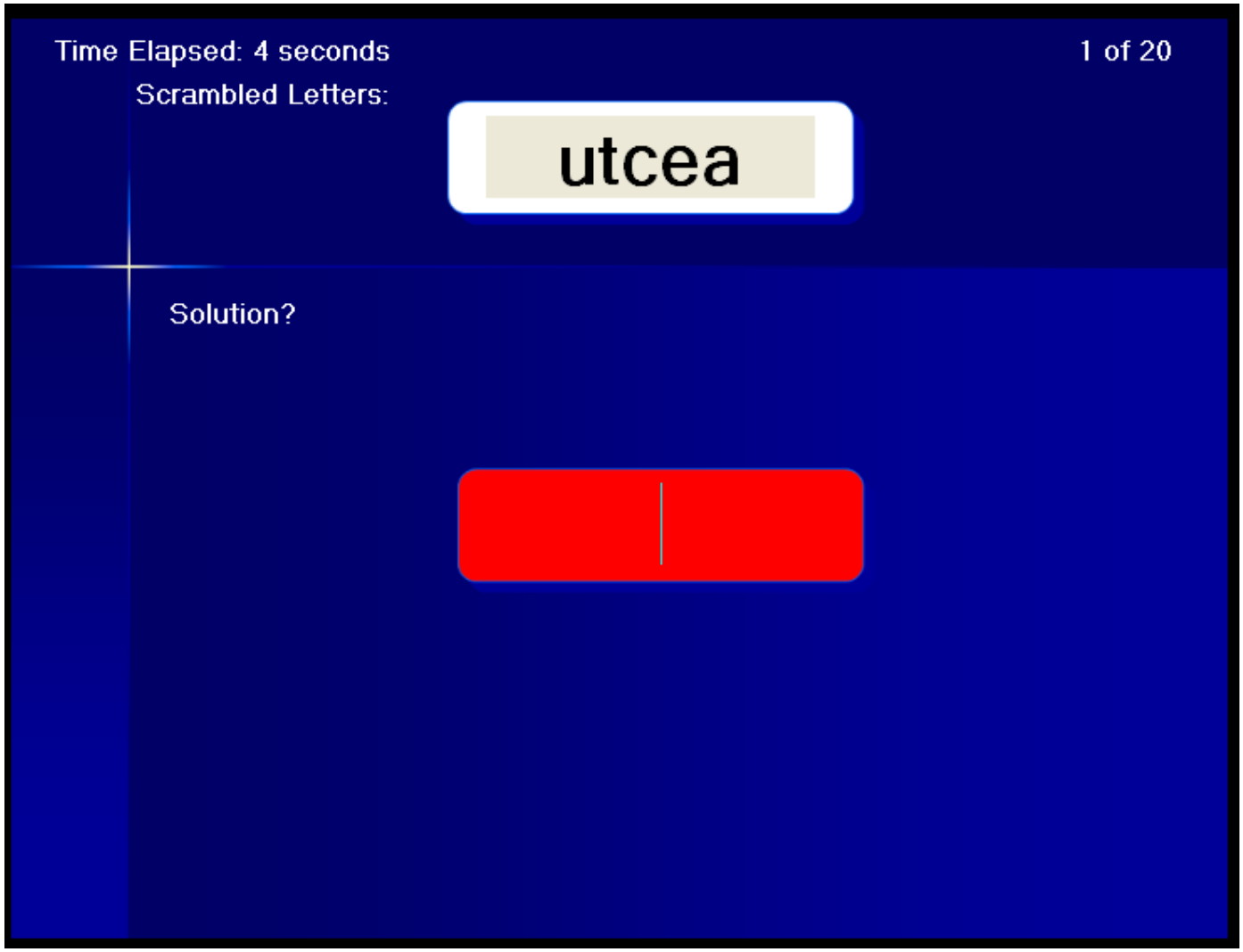
The edges do not have to be matched to anything else, so they will function as a place to put a tile for which there is no matching number face on any other tile. (Move 5803 to top row middle position of matrix) For example there is no 5 on the bottom of any tile to match with the 5 that is on the top of this tile so it must go on a top edge. Sometimes, there may be a match for a number, but the correct solution to the puzzle requires that it be placed on the edge anyway. (Move 1832 to top left position).

Once placed in the left matrix (move 3844 to bottom right) a tile may be moved to another location within the matrix as long as the number faces match up (move to bottom middle). When looking for matches, do not forget about tiles you may have already placed into the left matrix. It is possible that something you have place may be in the wrong spot (move 3844 middle right). Pieces may also be moved back into the right matrix (move back to the right matrix then replace in left matrix).

It is also possible to move whole matching row around in the left matrix, however, this must be done one tile at a time, and in an order which will not require the temporary placement of any tile next to any other tiles that do not have matching adjacent faces. For example if I move (move 8477 down one) this tile down first I cannot move

this (1832) tile down next (try) because it would require the 3 on its side to touch the 7 on the side of an adjacent tile. Instead I would have to go across the middle row then do the top row. (Demonstrate this, then put all pieces back, and finish solving puzzle).

Anagram Slide



Script for Anagram Demonstration

This is an anagram. An anagram is a group of letters which needs to be unscrambled, or placed in the proper order to form a word. Solving anagrams is another task being considered for inclusion in the SAT and ACT because it assesses verbal skills, concentration, and processing speed. All three of these skills are commonly measured in IQ tests, and are very indicative of academic success in college.

We will be using five letter anagrams, which if correctly rearranged will each form a five letter English word. Proper nouns, such as names of individuals or cities, will neither be used nor accepted. Each screen will present five letters such as the "AHTER" you see here in the white box. You then retype the letters in the proper order, into the red box, using the keyboard. As soon as you have typed the unscrambled word correctly the next anagram will be presented.

There are many possible orders for the letters, such as those seen here. (pan through orders), but only one will form an English word, that is not a proper noun. As you can see each of the letters in the word "earth" can be found among the letters in the anagram. "E A R T H" (pan through slides).

Your performance will be assessed in terms of both **ACCURACY** and **PROCESSING SPEED**. You will not be permitted to move on to the next word until you have found the proper sequence of the letters. The computer will count the **number of words correctly unscrambled** as well as the **number of seconds it take you to find the correct solution**. So, please work as quickly as possible. You will be presented with a total of 20 anagrams and have up to 90 seconds to determine the solution for each one.

Anagrams/Words to be Scrambled

1. acute
2. asked
3. candy
4. dwarf
5. fault
6. forum
7. graph
8. hoard
9. khaki
10. knelt
11. metal
12. often
13. piano
14. rhino
15. snack
16. style
17. thumb
18. tweak
19. vomit
20. wheat

Debriefing Statement for those in the Control Group

There is not really any known connection between your performance on the TetraVex game or the anagrams and the likelihood of being academically successful in college. Further, as far as we are aware there are no plans to incorporate either of these activities into the SAT or the ACT.

These tasks were presented to you under this pretense to prevent the tasks from being regarded as mere computer games that are not taken seriously. This study requires that the tasks are taken very seriously while a participant works on them.

Our study will be jeopardized if future students coming to our lab are informed about these facts. Therefore, PLEASE keep this knowledge a secret and do not inform other students who may participate in this study or who know other students who will come to our lab about this deception. We will debrief them in the same way as we debrief you.

If you have any further questions or would like to receive more information about our research, you may contact either Dr. Schroder or Cindy Ollis using the email addresses provided on the informed consent form provided to you.

Thank you again very much for your participation in our study.

Debriefing Statement for those in the Treatment Group

The TetraVex puzzles you received did not have solutions, so it was not your fault that you were not able to solve any of them. Also, giving you unsolvable TetraVex puzzles most likely caused you to perform more poorly on the anagrams than you would have done otherwise. Neither of these scores reflects how you would normally do on these puzzles.

All participants in this study were randomly assigned to either a success or failure condition. We are trying to assess reactions to failure to test the assumption that at least some participants start developing doubts, worries, and a negative mood that prevents them from performing their best on subsequent tasks. This study will hopefully aid in the development of a support program for students who tend to be easily discouraged by failure; something all of us experience from time to time during our academic careers.

Further, there is not really any known connection between students' performance on the TetraVex game or the anagrams and the likelihood of being academically successful in college, and as far as we are aware there are no plans to incorporate either of these activities into the SAT or the ACT. These tasks were presented to you under this pretense to prevent that the tasks from being regarded as mere computer games that are not taken seriously. The study requires that the tasks are taken very seriously while a participant works on them.

Our study will be jeopardized if future students coming to our lab are informed about these facts. Therefore, PLEASE keep this knowledge a secret and do not inform other students who may participate in this study or who know other students who will

come to our lab about this deception. We will debrief them in the same way as we debrief you.

Should you find that you have developed doubts, worries or a negative mood from this study that are not temporary you may contact the USU Counseling Center at (435) 797-1012.

If you have any further questions or would like to receive more information about our research, you may contact either Dr. Schroder or Cindy Ollis using the email addresses provided on the informed consent form provided to you.

Thank you again very much for your participation in our study.

Appendix B. IRB Approval Letters and Informed Consent Forms

Institutional Review Board
9530 Old Main Hill, Suite 214
Logan, UT 84322-9530
Telephone: (435) 797-1821
Fax: (435) 797-3769

USU Assurance: FWA#00003308
Protocol # 2374

9/1/2009

SPO #:
AES #: UTA00

MEMORANDUM

TO: Kerstin Schroder
Cindy Ollis

FROM: Kim Corbin-Lewis, IRB Chair
True M. Fox, IRB Administrator

SUBJECT: The Ability of the Coping Competence Questionnaire to Predict Resilience Against Learned Helplessness Among Undergraduate College Students: An Experimental Study

Your proposal has been reviewed by the Institutional Review Board and is approved under expedite procedure #7

X There is no more than minimal risk to the subjects.
There is greater than minimal risk to the subjects.

This approval applies only to the proposal currently on file for the period of one year. If your study extends beyond this approval period, you must contact this office to request an annual review of this research. Any change affecting human subjects must be approved by the Board prior to implementation. Injuries or any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Institutional Review Board.

Prior to involving human subjects, properly executed informed consent must be obtained from each subject or from an authorized representative, and documentation of informed consent must be kept on file for at least three years after the project ends. Each subject must be furnished with a copy of the informed consent document for their personal records.

The research activities listed below are expedited from IRB review based on the Department of Health and Human Services (DHHS) regulations for the protection of human research subjects, 45 CFR Part 46, as amended to include provisions of the Federal Policy for the Protection of Human Subjects, November 9, 1998.

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

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Page 1 of 1
Date Created: 08/31/2009
USU IRB Approved: 09/01/2009
Approval terminates:08/31/2010
Protocol Number: 2374
IRB Password Protected per IRB Coordinator

INFORMED CONSENT
Psychosocial Stress and Wellbeing among Undergraduate Students

Introduction/ Purpose Dr. Kerstin Schroder, assistant professor, and Cindy Ollis, graduate student, in the Department of Psychology at Utah State University are conducting a research study to better understand the psychosocial stress and wellbeing of undergraduate college students. There will be approximately 500 total participants in this research.

Procedures If you agree to be in this research study, the following will happen to you. You will be asked to complete a series of surveys on Blackboard. It should take about 50 minutes to an hour. This may be done in as many sessions as you desire.

Risks There is minimal risk involved in your participation in this research. It is possible that you may feel uncomfortable with some of the survey questions but you may skip those individual questions. There is some risk of loss of confidentiality when using online survey methods but we will take steps to minimize that risk, as described below.

Benefits There may or may not be any direct benefit to you from these procedures. The investigator, however, may learn more about the psychosocial stress and wellbeing of undergraduate college students.

Explanation and offer to answer questions Through this form, this research study has been explained to you. If you have other questions or research-related problems, you may reach Professor Schroder at (435) 797-1451.

Compensation You will receive either extra credit or a lab credit for your participation as explained by your professor in class.

Voluntary nature of participation and right to withdraw without consequence Participation in this research study is entirely voluntary. You may refuse to participate, refuse to answer any specific questions or withdraw at any time without consequence. Full completion of the survey by participants is very important to the research questions, however, and we encourage you to finish the survey. The percentage completed will be reported to the professor and extra credit/lab credit will be awarded according to the professor's class policy.

Confidentiality Research records will be kept confidential, consistent with federal and state regulations. There will be no personal identifying information in any data sets that are extracted from Blackboard and only the investigator and research assistants will have access to study data with personal information. To protect your privacy, your responses will be coded with a unique study ID that you will create and any records linking your name with that ID will be separated and kept on a password-protected computer or a locked file cabinet in a locked office. The data will be kept separate from the identifying information to maintain confidentiality. If you request to be contacted about participating in another study, only your name and contact information linked to the ID number you created will be

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Protocol Number: 2374
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INFORMED CONSENT
Psychosocial Stress and Wellbeing among Undergraduate Students

provided to the research staff. Personal, identifiable information will be kept for one year then destroyed.

IRB Approval Statement The Institutional Review Board for the protection of human participants at USU has approved this research study. If you have any pertinent questions or concerns about your rights or a research-related injury, you may contact the IRB Administrator at (435) 797-0567 or email irb@usu.edu. If you have a concern or complaint about the research and you would like to contact someone other than the research team, you may contact the IRB Administrator to obtain information or to offer input.

Copy of consent If you would like a copy of this Informed Consent you may save this PDF file and print a copy of it.

Investigator Statement "I certify that the purposes, risk and benefits of this research study have been explained to the individual through this document and that the individual has had the opportunity to have any questions answered."

Signature of PI & Student Researcher

Dr. Kerstin Schroder
435-797-1451 or 435-764-7258
Email: kerstin.schroder@usu.edu

Cindy Ollis
435-797-3307 or 435-752-3370
Email: c.ollis@aggiemail.usu.edu

Participant Consent If you have read and understand the above statements, please click on the "Sign Consent Form" button on the main page for the study and choose "yes" if you wish to participate in the study.

UtahState University
Department of Psychology
2810 Old Main Hill
Logan UT 84322
Telephone: (435) 797-1451

Page 1 of 2
Date Created: 09/01/2009
USU IRB Approved: 09/01/2009
Approval terminates: 08/31/2010
Protocol Number: 2374
IRB Password Protected per IRB Coordinator

INFORMED CONSENT
Evaluation of Problem Solving Tasks for College Entrance Exams

Introduction/Purpose: Dr. Kerstin Schroder, assistant professor, and Cindy Ollis, graduate student, in the Department of Psychology at Utah State University are conducting a research study to critically evaluate the utility of some problem solving tasks that are supposed to predict academic success in college and are currently considered for inclusion in future versions of the SAT or the ACT. There will be approximately 150 participants in this research.

Procedures: If you agree to be in this research study, the following will happen to you: First, you will be asked to read and sign this informed consent form. Then you will directed to a computer and prompted to login with the ID number that you have created. Once logged in, you will be asked to take a 5-minute survey. Next, problems will be presented to you for about 25 minutes. Subsequently, you will be asked to solve a different series of brief problems (five letter anagrams = scrambled words) for 30 minutes. Finally, you will be asked to complete two more brief feedback surveys (10 minutes). This will all be done in a single session. The entire session will take approximately one hour and fifteen minutes to one and a half hours to complete.

Risks: There is minimal risk involved in your participation in this research. It is possible that you may experience frustration if you find the computer game or scrambled words to be difficult to solve, or you may feel uncomfortable with some of the survey questions. There is a small risk of loss of confidentiality but we will take steps to minimize that risk, as described below.

Benefits: There may or may not be any direct benefit to you from these procedures. You may learn something about yourself and about the way research is conducted in our labs. However, even if you do not benefit personally, by participating in this research you will contribute to an important study that shall help us to understand the cognitive processes that play a role in solving these tasks.

Explanation & offer to answer questions This research study was explained to you and your questions have been answered. If you have other questions or research-related problems, you may reach Dr. Schroder at (435) 797-1451 or Cindy Ollis at (435) 752-3370.

Payment/Compensation You may choose to receive either extra credit (if it is offered by your instructor), $5 cash or a $10 Papa Murphy's gift certificate for your participation in this study. There is no cost for participation in the study.

Voluntary nature of participation and right to withdraw without consequence Participation in this research study is entirely voluntary. You may refuse to participate or withdraw at any time without consequence or loss of payment. You may be withdrawn (asked to leave) by the investigator if you are too loud or disruptive in the computer lab while others are working.

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Date Created: 09/01/2009
USU IRB Approved: 09/01/2009
Approval terminates: 08/31/2010
Protocol Number: 2374
IRB Password Protected per IRB Coordinator

INFORMED CONSENT
Evaluation of Problem Solving Tasks for College Entrance Exams

Confidentiality: Research records will be kept confidential, consistent with federal and state regulations. There will be no personal identifying information in any of the data sets and only the investigator and research assistants will have access to any personal information from the previous study. To protect your privacy, your responses will be coded with a unique Study ID that you have created and the record created linking your name with that ID will be kept on a password-protected computer or a locked file cabinet in a locked office. The data will not contain any personally identifiable information. Any personal, identifiable information will be kept for one year and then destroyed.

IRB Approval Statement The Institutional Review Board for the protection of human participants at USU has approved this research study. If you have any pertinent questions or concerns about your rights or a research-related injury, you may contact the IRB Administrator at (435) 797-0567 or email irb@usu.edu. If you have a concern or complaint about the research and you would like to contact someone other than the research team, you may contact the IRB Administrator to obtain information or to offer input.

Copy of consent You have been given two copies of this Informed Consent. Please sign both copies and retain one copy for your files.

Investigator Statement "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

Signature of PI & Student Researcher

_____	_____
Dr. Kerstin Schroder	Cindy Ollis
435-797-1451 or 435-764-7258	*435-797-3307 or 435-752-3370*
Email: kerstin.schroder@usu.edu	Email: c.ollis@aggiemail.usu.edu

Signature of Participant By signing below, I agree to participate.

_____	_____
Participant's signature	Date

Institutional Review Board
9530 Old Main Hill, Suite 214
Logan, UT 84322-9530
Telephone: (435) 797-1821
Fax: (435) 797-3769

(v7 08/26/2009)
USU IRB Approved
SEP 2 2 2009
amend#1

Amendment/Modification of an Approved Protocol/Informed Consent

This form may be used if changes to the study are minimal and do not change risk levels for participants. Changes in population, instruments, or procedures may require a new application. Major changes to the protocol and/or increased level of risk to participants require a new application form (e.g., change to a vulnerable population, major changes in procedures, major change in the direction of the study that may substantially change the purpose or goals of the study).

Principal Investigator: Kerstin Schroder **IRB #:** 2374
Certification expiration date: 08/08/12 (Click here to check expiration date)
Study title: Coping Confidence and Learned Helplessness
Original Approval Date: 9/1/09 **Approval Type:** expedite #7
Previous Amendment Dates:

1. **Revision Description:** (check all that apply)
   ☒ Revision to currently approved *protocol* (e.g., investigators, students, population, instruments, procedures)
   ☐ Revision to currently approved *consent*
   ☐ Other, e.g. advertisement

2. **Risk** (check one)**:**
   ☒ This revision ***does not*** increase risks to participants enrolled in the study
   ☐ This revision ***does*** increase risks to participants enrolled in the study (include explanation in revision description).

3. **Describe revision request (provide a brief description and justification for the requested revision and information on the level of risk to participants.** The original IRB submission materials showed incorrect (discarded) 4-point likert scales for both the CCQ and HSC rather than the most current 6 point and 5 point response scales (respectively). Please see attached file for the most current version of the response scales.
   Further, in the original submission materials, scanned copies of the (a) the Life Events Questionnaire and (b) the Negative Event Scale (to measure hassles) were only partially copied with one page for each questionnairwereonly. Both questionnaires contain multiple pages with items. (This may have been an artifact of them both being .mdi files.) We need to use the entire scales in order to obtain useful data on these. Please see the attached .tif and .mdi files of those documents (both are "picture" files, please use the version that works best on your computer). Finally, two questions dealing with exercise were supposed to have been included in the Health Related Questions.

4. **Attach or submit original materials (e.g., application, methods section of proposal, informed consent) and clearly identify the changes for which you are currently seeking approval by highlighting or using 'track changes' for all revisions. Include new or changed documents such as instruments or informed consent(s). If this is a second or further amendment, attach the most recent amendment documents approved by the IRB with current revisions clearly identified (highlighted or track changes); attach any new documents (e.g. instruments, new informed consent).**

Signature of PI: Email Date: 9-15-09
(email accepted as PI signature)

For IRB Office Only: Date of IRB Review: 9-22-09

☑ Approved: This signifies notification of *IRB Approval of the revision described above.*
☐ Not Approved ☐ Abstain
☐ This amendment represents substantial change – new application required
☑ Minor change

Donna Gilbertson

(v8 09/24/2009)

Institutional Review Board
9530 Old Main Hill, Suite 214
Logan, UT 84322-9530
Telephone: (435) 797-1821
Fax: (435) 797-3769

Amendment/Modification of an Approved Protocol/Informed Consent

This form may be used if changes to the study are minimal and do not change risk levels for participants. Changes in population, instruments, or procedures may require a new application. Major changes to the protocol and/or increased level of risk to participants require a new application form (e.g., change to a vulnerable population, major changes in procedures, major change in the direction of the study that may substantially change the purpose or goals of the study).

Principal Investigator: Kerstin Schroder **IRB #:** 2374
Certification expiration date: 8/31/2010 (Click here to check expiration date)
Study title: The Ability of the Coping Confidence Questionnaire to Predict Resilience Against Learned Helplessness Among Undergraduate College Students: An Experimental Study.
Original Approval Date: 9/1/2009 **Approval Type:** Expedite #7
Previous Amendment Approval Dates: 9/22/2009

1. **Revision Description:** (check all that apply)
   ☒ Revision to currently approved *protocol* (e.g., investigators, students, population, instruments, procedures)
   ☐ Revision to currently approved *consent*
   ☐ Other, e.g. advertisement

2. **Risk** (check one)**:**
   ☒ This revision ***does not*** increase risks to participants enrolled in the study
   ☐ This revision ***does*** increase risks to participants enrolled in the study (include explanation in revision description).

3. **Describe revision request (provide a brief description and justification for the requested revision and information on the level of risk to participants.** We would like to request a time inturrum of three or four weeks between participation in the study and the debriefing. This will allow us to complete data collection (at least for a given class) before the students have the opportunity to discuss the unsolvability of some of the puzzles with their peers who have not yet, but will participate in the study. We have strong evidence from comments made by participant during the qualitative survey asking about their experiences participating in the study that many of the data have been contaminated by students who have participated talking to other students who will soon participate in the study. For example, we have gotten comments from students that they knew the puzzles were unsolvable. We have even heard comment from participants in the control group who receive primarily very easy puzzles that they thought all the puzzles were unsolvable and had they known that the puzzles were solvable they would have done better. A foreknowledge that the puzzles may be unsolvable renders the data useless. The debriefing would then be giving to the entire class, and those who participated would also be emailed the debriefing and any who didn't provide email addresses would be called. (No students are able to participate in this study without having provided either an email address which they check and respond to or a functioning phone number because we are unable to contact them to schedule a time for them to come in and participate.
   .
   We would also like to switch the order of the anagrams and the second administration of the POMS. It is possible that students experience with the anagrams may be altering students mood resulting

from playing tetravex. It would therefore be prudent for us to measure their mood immediately after playing tetravex rather than waiting until the end.

4. **Attach or submit original materials (e.g., application, methods section of proposal, informed consent) and clearly identify the changes for which you are currently seeking approval by highlighting or using 'track changes' for all revisions. Include new or changed documents such as instruments or informed consent(s). If this is a second or further amendment, attach the most recent amendment documents approved by the IRB with current revisions clearly identified (highlighted or track changes); attach any new documents (e.g. instruments, new informed consent).**

Signature of PI: email from PI received January 13, 2010

==========

For IRB Office Only: Date of IRB Review: January 15, 2010

☒ Approved: This signifies notification of *IRB Approval of the revision described above.*
☐ Not Approved ☐ Abstain
☐ This amendment represents substantial change – new application required
☒ Minor change

Department of Psychology
2810 Old Main Hill
Logan UT 84322
Telephone: (435) 797-1451

USU IRB Approved: 09/01/2009; Page 1 of 2
Approval terminates: 08/31/2010
Protocol Number: 2374; Amend#2 Approved 01/14/2010
IRB Password Protected per IRB Administrator

INFORMED CONSENT
Evaluation of Problem Solving Tasks for College Entrance Exams

Introduction/Purpose: Dr. Kerstin Schroder, assistant professor, and Cindy Ollis, graduate student, in the Department of Psychology at Utah State University are conducting a research study to critically evaluate the utility of some problem solving tasks that are supposed to predict academic success in college and are currently considered for inclusion in future versions of the SAT or the ACT. There will be approximately 150 participants in this research.

Procedures: If you agree to be in this research study, the following will happen to you: First, you will be asked to read and sign this informed consent form. Then you will directed to a computer and prompted to login with the ID number that you have created. Once logged in, you will be asked to take a 5-minute survey. Next, problems will be presented to you for about 25 minutes. Then you will be asked to complete another 5-minute survey. Subsequently, you will be asked to solve a different series of brief problems (five letter anagrams = scrambled words) for 30 minutes. Finally, you will be asked to complete a brief feedback survey (5 minutes). This will all be done in a single session. The entire session will take approximately one hour and fifteen minutes to one and a half hours to complete.

Risks: There is minimal risk involved in your participation in this research. It is possible that you may experience frustration if you find the computer game or scrambled words to be difficult to solve, or you may feel uncomfortable with some of the survey questions. There is a small risk of loss of confidentiality but we will take steps to minimize that risk, as described below.

Benefits: There may or may not be any direct benefit to you from these procedures. You may learn something about yourself and about the way research is conducted in our labs. However, even if you do not benefit personally, by participating in this research you will contribute to an important study that shall help us to understand the cognitive processes that play a role in solving these tasks.

Explanation & offer to answer questions This research study was explained to you and your questions have been answered. If you have other questions or research-related problems, you may reach Dr. Schroder at (435) 797-1451 or Cindy Ollis at (435) 752-3370.

Payment/Compensation You may choose to receive either extra credit (if it is offered by your instructor), $5 cash or a $10 Papa Murphy's gift certificate for your participation in this study. There is no cost for participation in the study.

Voluntary nature of participation and right to withdraw without consequence Participation in this research study is entirely voluntary. You may refuse to participate or withdraw at any time without consequence or loss of payment. You may be withdrawn (asked to leave) by the investigator if you are too loud or disruptive in the computer lab while others are working.

Confidentiality: Research records will be kept confidential, consistent with federal and state regulations. There will be no personal identifying information in any of the data sets and only the

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USU IRB Approved: 09/01/2009; Page 2 of 2
Approval terminates: 08/31/2010
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IRB Password Protected per IRB Administrator

INFORMED CONSENT
Evaluation of Problem Solving Tasks for College Entrance Exams

investigator and research assistants will have access to any personal information from the previous study. To protect your privacy, your responses will be coded with a unique Study ID that you have created and the record created linking your name with that ID will be kept on a password-protected computer or a locked file cabinet in a locked office. The data will not contain any personally identifiable information. Any personal, identifiable information will be kept for one year and then destroyed.

IRB Approval Statement The Institutional Review Board for the protection of human participants at USU has approved this research study. If you have any pertinent questions or concerns about your rights or a research-related injury, you may contact the IRB Administrator at (435) 797-0567 or email irb@usu.edu. If you have a concern or complaint about the research and you would like to contact someone other than the research team, you may contact the IRB Administrator to obtain information or to offer input.

Copy of consent You have been given two copies of this Informed Consent. Please sign both copies and retain one copy for your files.

Investigator Statement "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

Signature of PI & Student Researcher

Dr. Kerstin Schroder	Cindy Ollis
435-797-1451 or 435-764-7258	*435-797-3307 or 435-752-3370*
Email: kerstin.schroder@usu.edu	Email: c.ollis@aggiemail.usu.edu

Signature of Participant By signing below, I agree to participate.

Participant's signature	Date

CURRICULUM VITAE

Cindy L. Ollis (2010)
Email: c.ollis@aggiemail.usu.edu

EDUCATION

Ph.D.: Utah State University, Logan, UT — May 2010
Major Field: Psychology — GPA 3.96
Emphasis: Research and Evaluation Methodology
Research: The ability of the Coping Competence Questionnaire to predict resilience against learned helplessness among undergraduate college students: An experimental study
Grant: Graduate Student Senate Research and Projects Grant, $750: Participant payment, record forms, and computer programming

M.S.: Utah State University, Logan, UT — May 2009
Major Field: Psychology — GPA 3.96
Emphasis: Research and Evaluation Methodology
Research: Evaluate the allocation of funding for assistive technology by the Utah State Office of Rehabilitation

B.A.: Utah State University, Logan, UT, Magna Cum Laude,with university honors and honors in music — May 1999 — GPA 3.91
Major Field: Music
Emphasis: Vocal Performance
Minor: Japanese

RESEARCH EXPERIENCE

Utah State University, Logan, UT

Director of Research Lab — Spring 2010-present

- Directed research lab with 9 undergraduate research assistants
- Conducted 3 different studies simultaneously on the moderator effects of coping skills on performance and depressed mood when people are faced with stress or repeated failure, the impact of glycemic load on weight

loss, and the correlation between coping competence and depression
- Tools used include: research group meetings, Randomized Controlled Trial (RCT) data collection, survey data collection, self-report food diary data collection, SPSS, Excel, Access, and Blackboard
- Participant recruitment and reminders involved personal addresses to classes of up to 1000 students, phone calls, and e-mails

RESEARCH EXPERIENCE, Continued

Manager of Research Lab Fall 2009-Spring 2010
- Managed research lab of Dr. Kerstin Schroder with 6 undergraduate research assistants
- Conducted 5 studies simultaneously on self-control, dieting and weight loss, coping skills, stress, depression, and instrument validation
- Tools used include: Group meetings, RCT data collection, survey data collection, self-report food diary data collection, SPSS, Excel, Access, a specialized computer program designed to execute one of the experimental studies, and Blackboard.
- Participant recruitment and reminders involved personal addresses to classes of up to 1000 students, phone calls, and e-mails

Graduate Research Lab Assistant and Supervisor Fall 2007-Spring 2009
- Work in the research lab of Dr. Kerstin Schroder to conduct a study on the effect of diet intentions, self-control, and food smells on quantity of less healthy food consumption, and reliability studies on Habitual Self-Control questionnaire and the Coping Competence Questionnaire
- Work with USU research team on NIH grant to evaluate public schools' progress with funds provided by NIH for improving science and math programs Fall 2004-Spring 2005

RESEARCH CONSULTING EXPERIENCE

Through Utah State University, Logan, UT

Researcher, Data Analyst, & Focus Group Director August 2008- present

- Bear River Health Department, Cache and Box Elder Counties, Utah
- Strategic Planning Framework grant for examining usage trends and popular beliefs regarding prescription narcotic use, misuse, and abuse among the residents of Cache and Box Elder Counties in Utah

Researcher and Evaluator Summer 2006-Spring 2009

- Utah State Office of Rehabilitation (USOR), Salt Lake, Utah
- Conducted an evaluation of population and usage trends among those to whom funding for assistive technology was provided between 2003 and 2007
- Combined multiple preexisting Excel data sets using Access, analysis performed with SPSS and Excel

TEACHING EXPERIENCE
Utah State University, Logan, UT

Instructor

- Curriculum development, instruction/lecturing, grading, and assigning final grades for:

Music 1630, Individual Vocal Instruction	Fall 1998-Spring 1999
Psychology 4430, Lab for Cognitive Psychology; 2 sections	Spring 2009

Teaching Assistant

- Office hours and tutoring, grading, group project leader, occasional lecturing, quiz and exam administration
- Exam and quiz writing, item analysis for quiz and exam questions to maximize information provided by the scope of the quiz/exam through revision questions for use on future exams/quizzes

- Courses include:

Psychology 5330 Psychometrics	Fall 2004
Psychology 3350 Research Methods	Fall 2005-Spring 2006
Psychology 6010 Introduction to Program Evaluation	Fall 2006
Psychology 6570 Introduction to Education & Psychological Research	Fall 2006-Summer 2007
Psychology 7610 Measurement, Design, & Analysis II	Spring 2007
Psychology 4420 Cognitive Psychology	Spring 2009

PUBLICATIONS

Ollis, C. L. (2010). The ability of the Coping Competence Questionnaire to predict learned helplessness among undergraduate college students: An experimental study. Dissertation, Utah State University.

Schroder, K. E. E., & Ollis, C. L (2010). The coping competence questionnaire: A new measure based on learned helplessness theory of depression. Unpublished manuscript, Utah State University, Psychology Department.

Schroder, K. E. E., & Ollis, C. L. (April 2010). Inter-individual Differences in the Self-Regulation of Health (Risk) Behaviors. Presented at the Society of Behavioral Medicine Conference, Seattle,WA.

Ollis, C. L. (March 2010). The Ability of the Coping Competence Questionnaire to Predict Resilience Against Learned Helplessness Among Undergraduate College Students: An Experimental Study. Presented at the Intermountain Graduate Research Symposium, Logan, UT.

Ollis, C. L. (2009). An evaluation of the allocation of funding for assistive technology: A case study. Master's Thesis, Utah State University.

Ollis, C. L., Davies, S. H., & Schroder, K. E. E. (August 2008). Coping Competence: A New Measure Based on Learned Helplessness Theory. Presented at the American Psychological Association Conference, Boston, MA.

Ollis, C. & Blair, M. (March 2008). Use of State Funds to Purchase Assistive Technology Devices and Services. Presented at the University of Utah Disability Studies Forum, Salt Lake City, UT.

LANGUAGE SKILLS

Czech (conversational)
Spanish (intermediate)
Japanese minor (basic)
German, one year in college (basic)

KEY COURSES

Statistical Methods, Research Design, & Data Evaluation

- Psychometrics
- Introduction to Program Evaluation
- Introduction to Education and Psychological Research
- Measurement, Design, and Analysis I & II
- Multivariate Methods in Psychology and Education
- Advanced Evaluation Methods and Techniques
- Advanced Measurement Theories and Practice
- Qualitative Methods
- Design of Experiments (ANOVA with repeated measures and nested designs using SAS)
- Analysis of Unbalanced Data
- Single-subject research

Research Related Areas

- Program Seminar in Research and Evaluation
- Grantwriting
- Literature Review in Education and Psychology
- Independent study on instrument development
- Independent research

General psychology

- Cognition & Instruction
- Developmental Psychology
- History & Systems
- Independent Study on Behavioral Analysis

Teaching

- College Teaching Seminar
- University Teaching Apprenticeship